THE INSECT PEST SURVEY BULLETIN

Volume 21 Supplement No. 5 July 15, 1941

BUREAU OF
ENTOMOLOGY AND PLANT QUARANTINE
UNITED STATES
DEPARTMENT OF AGRICULTURE
AND
THE STATE ENTOMOLOGICAL
AGENCIES COOPERATING

I N S E C T P E S T S U R V E Y B U L L E T I N

Vol. 21 Supplement No.

THE SPECIES AND DISTRIBUTION OF GRASSHOPPERS IN THE 1939 OUTBREAK

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The year 1939 was the sixth year in which the species of grasshoppers were recorded for the several States included in the annual grasshopper survey. Data for the 1934, 1935, 1936, 1937, and 1938 collections were published as supplements to the Insect Pest Survey Bulletin as follows: Volume 14, No. 9; volume 16, No. 5; volume 17, No. 3; volume 18, No. 6; volume 19, No. 4.

In 1939 22 States were included in this project and 131,605 specimens were collected in their typical grasshopper habitats. Fred E. Skoog, survey supervisor, made the identifications and much credit goes to him and to the rest of the survey unit of the grasshopper control project for the gathering of data concerning developments within the infestations during the active grasshopper season. The following summary of the general situation during 1939 is based on data gathered by this unit.

General Situation in 1939 from an Economic Standpoint

In 1938 unprecedented flights of Melanoplus mexicanus Sauss. in the Northern Great Plains area invaded western North Dakota, eastern Montana, Wyoming, the Black Hills section of South Dakota, western Nebraska, and the Red River Valley of Minnesota and North Dakota. Because of the 1938 flights, large areas of depleted range land in eastern Montana and the bottom land along the Big Missouri and Little Missouri Rivers, together with most buckbrush patches in the Bad Lands of western North Dakota, were heavily infested in 1939. One range land area north of Miles City, Mont., and extending west to the Musselshell River, averaged about 50 grasshoppers per square yard over 4,000 square miles. Between Williston and Walters Ferry, N. Dak., along the Missouri River bottom, populations of M. mexicanus ranged from 50 to 500 per square yard. The Bad Lands along the Little Missouri between North Roosevelt Park and Medora, N. Dak., flats in the river bottom and benches above the flats averaged 75 to 150 per square yard. Leading down to the Little Missouri River are long, dry creeks and innumerable steep draws from one to several miles long. Each draw or coulee had its quota of hoppers, averaging from 50 to 150 per square yard.

In all of the Black Hills area of South Dakota and Wyoming every mountain-hay meadow, pasture, and cropped field was severely infested with M. mexicanus hatching from eggs deposited by grasshoppers in flight. Populations ran as high as 5,000 per square yard and one observation showed all the buckbrush (Symphoricarpos) in 3 acres destroyed down to the roots by the grasshoppers, which had defoliated and decorticated it.

In eastern Wyoming and western Nebraska heavy infestations occurred in most of the favorable crop fields and especially in strip-farmed and stubbled-in grainfields.

In the northern Red River Valley, severe infestations of M. mexicanus occurred in pastures, waste areas, stump land, alfalfa fields, and other habitats. From these places they migrated into the crops. In south-central and southeastern South Dakota, southwestern Minnesota, and northeastern Nebraska severe local infestations of Melanoplus bivittatus Say, M. differentialis Thos, M. mexicanus, and M. femur-rubrum Deg. occurred. In the Hamill, S. Dak., district, the center of the disastrous 1931 outbreak, M. bivittatus hatched out in corn and sorghum stubble planted to small grain. Populations of 300 per square yard were not uncommon. In the buffalo and grama grass sod clumps along the edges of coulees, egg pods of M. differentialis averaged as high as 12 per square foot the first half of May at the same places where populations of M. bivittatus nymphs averaged 350 per square yard.

The area infested by Dissosteira longipennis Thos. included parts of 5 States; namely, southeastern Colorado, southwestern Kansas, Panhandle of Oklahoma, Panhandle of Texas, and northeastern New Mexico, with the major infestations in Colorado, New Mexico, and Texas. In these 3 States, during the 1939 spring egg surveys, a total of 75 egg beds were examined for eggs. The egg beds ranged in size from 1/2 acre to 200 acres, with an average of 15 acres per bed. The average egg-pod population ranged from 0.7 pod to 20 pods per square foot with an average of 5.8 pods per square foot for the 75 beds.

First-instar nymphs upon hatching numbered as high as 2,000 per square yard, with an average of 500. In many instances, within a week or 10 days after hatching, nymphs occupied 10 times the area of the egg bed. In Colorado it was estimated that the last-instar nymphs altogether covered 5 times as much area as the original egg beds and in New Mexico 10 times as much.

The population of M. mexicanus in the most severely infested areas of eastern Montana and western North Dakota were reduced to non-economic numbers in much of the area. This was accomplished largely by flights out of the area, although control measures may have reduced populations about 10 percent. In western Nebraska, western South Dakota, and eastern Wyoming, damage to small grain was reduced 50 percent by baiting. Infestations were reduced by flights out of the area and control measures until only local infestations remained. In the D. longipennis area populations of this species were reduced largely by

baiting operations to noneconomic proportions in Texas, to about 250 acres of egg beds in New Mexico, and to 1,910 acres of egg beds in Colorado.

Fall Egg Survey in 1939

The 1939 fall egg survey showed that areas of severe infestation had shifted considerably in the Melanoplus mexicanus area. In Montana the north-central counties were the most heavily infested. This was the area where the 1939 flights from eastern Montana terminated. In eastern Montana, from light to subnormal egg populations were found in areas most heavily infested during 1939. A large portion of eastern North Dakota was severely infested with M. mexicanus and M. bivittatus, while western North Dakota was comparatively lightly infested.

The eastern half and two-thirds of the southern half of South Dakota was also infested. From the Dakotas the infestation extended into the western third of Minnesota and the extreme northwestern part of Iowa. A large part of this whole area in these three States lies within the 20-inch rainfall belt. These infestations were a local build-up of M. differentialis, M. bivittatus, and M. mexicanus in the southern part. In the northern part it was largely M. mexicanus.

A spotted, severely infested area lay diagonally from eastern Nebraska across western Kansas, extending into eastern Colorado and the Panhandles of Oklahoma and Texas. In Kansas and parts of eastern Colorado Aeoloplus turnbullii Thos. was of recent economic importance. It proved a damaging species in 1938 but it is still an undetermined factor in the grasshopper outbreaks. M. mexicanus has become of increasing importance in both western Oklahoma Panhandle and northern Texas Panhandle. This is also true of parts of eastern Colorado, especially the northeastern part.

Infestations in western Nebraska were down, but not to the extent they were down in eastern Wyoming and western South Dakota. In Nevada and Utah there were severe local infestations, but for Idaho, Washington, and Oregon, there was a very small grasshopper problem. This was also true for most of Arizona, New Mexico, Oklahoma, Arkansas, Missouri, Illinois, Iowa, and Wisconsin. The northern half of the Southern Peninsula of Michigan had some severe local infestations. In California the Imperial Valley showed a severe infestation of M. mexicanus. There were also local spots of infestations of different species scattered in their usual areas.

Infestations of Dissosteira longipennis were about completely wiped out in Texas. There were two small areas in New Mexico and about 100 small egg beds in the southeastern quarter of Colorado.

For the entire area, severe infestations were limited to about seven or eight States at most, many of which are in heavily cropped areas. For this reason, they were of greater economic importance but probably provided a better opportunity for organized control.

Apparent Decrease of Melanoplus mexicanus in Relative Abundance

Melanoplus mexicanus egg pods were found during the egg survey in eastern North Dakota and north-central Montana in as great numbers as ever in the history of surveys, but collections of grasshoppers made in these States and others of the main M. mexicanus area showed a decided decrease in the relative abundance of M. mexicanus from 1938 to 1939. A verification of this is found in a comparison of the percentages of M. mexicanus in the collections made on range land and in all habitats for these years. These data are given in tables 1 and 1 A. On the range land there is a decrease of from 9 to 36 in the percentage, with an average of 14 percent for the entire area. For all habitats this decrease is from 7 to 17 percent, with an average of 10 percent. All this indicates a downward trend in the numbers of M. mexicanus, although it remains the most important species and was very abundant over large areas.

Table 1.--Decrease of relative abundance of Melanoplus mexicanus on range land

State	M. mexicanus taken		
	1938	1939	Difference
	Percent	Percent	Percent
Montana	54	18	-36
North Dakota (eastern)	32	18	-14
North Dakota (western)	32	8	-24
South Dakota	15	6	- 9
Nebraska	29	16	-13
Wyoming	29	20	- 9
Entire area	28	14	-14

Table 1 A.--Decrease of relative abundance of Melanoplus mexicanus for a total of specimens collected in all habitats

State	M. mexicanus taken		
	1938	1939	Difference
	Percent	Percent	Percent
Montana	63	46	-17
North Dakota	49	37	-12
South Dakota	40	28	-12
Nebraska	32	25	- 7
Wyoming	36	26	-10
Entire area	42	32	-10

Seasonal Population Trends of Grasshopper Infestations for Different Crops and Habitats

Systematic observations were made throughout the 1939 season in the main grasshopper areas by special survey men, therefore three of these areas will be discussed separately. On the basis of weekly estimates of the number of grasshoppers per square yard occurring in different crops and habitats, population trends have been traced for all of the nymphal period and part of the adult period, as shown in table 2. For most of the habitats the peak of nymphal population was reached by May 13. The peak of nymphal population for mountain-hay meadows was June 3, and for corn June 24 (table 2).

The trends of grasshopper infestations in the various habitats in Montana and North Dakota (northern M. mexicanus area) and in Wyoming, South Dakota, and Nebraska (southern M. mexicanus area) represent populations containing from 75 to 80 percent M. mexicanus. There was a rapid increase in populations from hatching to the peak and then a gradual decrease took place. The range land shown for Montana and North Dakota was, for the most part, depleted range of sage brush, Russian-thistle, pricklypear cactus, pepper grass (Lepidium), western wheat (Agropyron smithii), needlegrass (Stipa), and other grasses (Poa spp.). In the northern M. mexicanus area there was a second peak in small grain the week of July 1. This was probably due to migration of grasshoppers from destroyed fields and distant idle and depleted range lands into grainfields that had not been previously infested.

Table 2.--Seasonal population trends of grasshopper infestations for different crops and habitats--shown as the average number of grasshoppers per square yard occurring during each week from hatching time to adult survey

Crop and habitat	May				June				July					August		
	6	13	20	27	3	10	17	24	1	8	15	22	29	5	12	19
Western North Dakota and eastern Montana (northern Melanoplus mexicanus area):																
Range land	--	--	158	145	--	--	106	80	55	20	7	5	2	3	2	2
Margins	--	137	130	123	104	93	46	52	52	47	29	26	26	5	4	2
Idle land	73	110	115	111	69	51	55	31	31	27	0	--	--	-	0	0
Small grain	--	66	62	66	45	41	24	51	55	50	18	14	12	4	3	2
Eastern Wyoming, Black Hills section South Dakota and western Nebraska (southern Melanoplus mexicanus area):																
Mt.-hay meadow	--	--	113	358	605	--	--	185	21	--	27	10	--	-	-	-
Margins	605	610	313	360	275	238	150	120	125	63	35	30	--	-	-	-
Idle land	70	66	49	50	49	50	45	37	18	16	12	8	--	-	-	-
Alfalfa	96	112	103	106	88	86	75	64	39	37	21	21	--	-	-	-
Small grain	25	50	60	56	50	37	37	40	35	34	20	18	--	-	-	-
Southeastern South Dakota, northeastern Nebraska, northwestern Iowa (Melanoplus bivittatus and Melanoplus differentialis area):																
Margins	0	46	44	93	101	116	82	64	50	36	31	28	--	-	-	14
Alfalfa	0	21	24	36	32	30	26	24	28	21	20	17	--	-	-	7
Sweet clover	--	0	90	88	46	41	40	35	34	24	19	12	--	-	-	14
Small grain (not stubbled-in)	--	--	--	--	22	21	22	19	17	9	10	11	--	-	--	4
Small grain (stubbled-in)[1/]	0	17	16	51	43	47	36	34	27	14	12	11	--	-	-	4
Corn	--	--	--	--	--	--	4	10	12	12	11	11	--	-	-	4

1/ Corn and sorghum stubble.

In the southern area, J. A. Gillett found that stubble fields deeply plowed were comparatively free from grasshoppers. Spring grain which had been disked or stubbled-in hastened hatching by removing the weed cover and fields stubbled-in had the most grasshoppers. At the time of hatching the wheat plants were from 2 to 4 inches high and very susceptible to total damage.

In table 2 there are also shown population trends for the main crops and habitats in the M. bivittatus and M. differentialis areas in South Dakota, Nebraska, and Iowa. Comparing trends in this area with those in the main M. mexicanus areas, one notes that the peak of population was reached more slowly, probably because of a slower rate in hatching. The greatest difference was in the margins, in which there was a big difference in the quantity of plant cover with taller and heavier sod and weed conditions in the M. bivittatus-differentialis areas.

Further study of table 2 shows that small grain stubbled into corn or sorghum had 2-1/3 times as many grasshoppers as did the grain sown in deep-plowed corn or sorghum stubble. It also shows that no grasshoppers appeared in the grain on plowed land until 3 weeks after they had hatched in the stubbled-in grain. The infestations in the grain on plowed land were caused by grasshoppers moving in from outside sources. Grasshoppers did not appear in the corn until the week of June 17, which was 5 or 6 weeks after hatching had begun. From the peak of the nymphal infestations to the adult survey on August 19, populations fell off 90 percent.

It was observed that within a day after alfalfa was mowed and raked most of the nymphs beyond the third instar in development had moved to the edge of the field or into adjacent crops. When new plant growth started the grasshoppers often moved back. Late in June, when the grain or alfalfa was harvested, the corn was invaded. Local movements consisting of shifting flights of M. bivittatus and M. differentialis began on a large scale about July 6 and continued into August.

Melanoplus mexicanus Area

This area embraced the eastern third of Montana, the western half of North Dakota, eastern Wyoming, the Black Hills section of South Dakota, and western, or Panhandle section of Nebraska. The survey supervisors working in this area were J. A. Gillett and F. E. Skoog. The following account is based on their observations.

Hatching of M. mexicanus began on April 25 and extended to June 1, with a general hatch the first week of May. In this area M. bivittatus was reported as hatching along with M. mexicanus.

For M. mexicanus and M. bivittatus it was known that in the spring additive amounts of daily maximum air temperatures above 60° F. would have to equal from 150° to 200° before hatching began. Therefore, progressive daily totals of the numbers of degrees the maxima went above 60° were kept for important stations scattered throughout the entire infested area.

This gave some advance knowledge of when to expect hatching. Table 3 shows the sums for the main stations in the M. mexicanus area.

Table 3.—Sums of Degrees of Daily Maximum Temperatures Above 60° in the Spring Before First Hatching of M. mexicanus 1/

Station	Date of first hatch	Sum of degrees
Valentine, Nebr.	April 24	172
Newcastle, Wyo.	April 28	150
Williston, N. Dak.	May 1	170
Bismarck, N. Dak.	May 1	196
Dickinson, N. Dak.	May 1	194
Grand Forks, N. Dak.	May 6	178
Lead, S. Dak.	May 13	160

1/ M. bivittatus was reported hatching along with M. mexicanus.

The accumulative temperatures for Grand Forks, N. Dak., amounted to 114° on and including May 2 and as yet no hatching had been reported for that area. It was predicted that hatching would take place in this area within the next 3 or 4 days, provided maximum air temperatures rose above 70°. Hatching did take place at this time as shown in table 3. During the 3 days after May 2, 64° more above 60° maximum were added to the total of 114°, making a total of 178° before hatching was observed.

In the Black Hills area, hatching was from 7 to 25 days later than in the open-plains areas. This was due to lower temperatures and more moisture. First hatching was estimated to be about May 13, because on May 19 a collection of nymphs showed 60 percent first instars and 40 percent second instars. By May 13 daily maximum temperatures above 60° had totaled 160°. It is believed that this gives a rough method for predicting the date when hatching will begin.

For the whole area, fields of small-grain stubble covered with Russian-thistle were the most common source of infestations for M. mexicanus. Other sources were idle land, pure stands of alfalfa, native grass-hay meadows, depleted range land, buckbrush draws, river bottom, and bench. Remarkably few M. mexicanus were present on good grama-grass range land. This was especially noticeable where the grama grass grew up to the edge

of buckbrush patches or draws containing Poa or western wheatgrass, which had several times as many hoppers as did the grama grass. Nymphal populations in the fields ranged from 25 to 300, with occasional concentrations of 1,000 to 5,000 per square yard.

Adults appeared by May 30 in the southern area (Wyoming, South Dakota, and Nebraska); by June 15 from 5 to 35 percent were adult, and by the first of July from 75 to 95 percent were adult. Local flights were observed in Nebraska from June 14 to 21. One June 20 a major flight began to develop on the large range area north of Miles City, Mont. From then on flights throughout the entire area at first increased in size and frequency and then continued throughout July and August and into September.

The greatest sources of flights were the north half of the Black Hills, in Lawrence and Pennington Counties, S. Dak., west-central Nebraska, (made up of Box Butte, Sioux, Morrill, and Scotts Bluff Counties), and southeastern Wyoming (composed of Niobrara, Goshen, Laramie, and Platte Counties). In the northern area the main sources of flight were the Missouri and Little Missouri watershed in western North Dakota, including the bottom lands in the Bad Lands and along the river courses proper, and the 4,000-square-mile range area in Garfield County north of Miles City.

Flights from the Black Hills section were mostly toward the northwest; those from western Nebraska and southeastern Wyoming were to the south and southwest into northwestern Kansas, northeastern Colorado, and the counties along the northeastern front of the mountains in Colorado. The main flights in western North Dakota and eastern Montana were west and northwest. They terminated in the north-central counties of Montana.

Owing largely to emigration of the adults by flight, comparatively few eggs were laid in the main area in which the M. mexicanus infestation of 1939 developed. Mr. Gillett prepared a table showing the differences in his area between the average ratings resulting from the fall egg surveys of 1938 and 1939.

Table 4.--Difference in average ratings in fall egg surveys, 1938 and 1939

Area	Average ratings in fall egg surveys	
	1938	1939
Western Nebraska - - - - - - - -	2.9	2.1
Western South Dakota - - - - - -	2.8	1.8
Eastern Wyoming - - - - - - - -	3.1	1.9

Mr. Skoog, in the northern area, prepared a table showing the differences between the average number of egg pods per square foot in the spring and fall egg surveys of 1939 in his area.

Table 5.--Comparison between egg pods per square foot, spring and fall surveys, 1939

Area	Average number pods per square foot	
	Spring 1939	Fall 1939
Eastern Montana	2.60	0.16
Western North Dakota	6.45	.36

Both of these tables indicate a great reduction in the infestations in the main M. mexicanus area.

Second Generation of Melanoplus mexicanus

Early in August 1939 a second generation of M. mexicanus began hatching in western Kansas, the Oklahoma Panhandle, the northern part of the Texas Panhandle, and in southeastern Colorado. In this region, the first generation was of minor importance in Texas but increased in numbers northward until it comprised half the grasshopper population in parts of Kansas and Oklahoma. In the Oklahoma Panhandle the first generation was reduced by baiting operations to an average of less than 5 per square yard in marginal areas and 1 per square yard in fields. The light residual population laid many eggs, of which at least 95 percent hatched. The second generation resulted in a surprising increase in population and proved more important than the first generation, with respect to crop damage. From a normal-to-light spring infestation there developed a light-to-threatening second generation, and from eggs of the second generation a threatening-to-severe infestation developed in the spring of 1940.

Melanoplus bivittatus and Melanoplus differentialis Area

This area included southeastern and south-central South Dakota, extreme southwestern Minnesota, western Iowa, northwestern Missouri, and eastern Nebraska. Very few observations were made in Missouri because of the low grasshopper populations found there. The survey supervisor for this area was D. R. Lindsay, and the following discussion is based on his notes and observations.

There were three major species involved in this area--Melanoplus bivittatus, M. differentialis, and M. mexicanus, named in the order of their importance. Melanoplus femur-rubrum was also abundant in places. Both M. differentialis and M. femur-rubrum hatch 2 or 3 weeks later than the other two, and this in itself prolonged the hatching period in this area, which began the first week of May and continued to August.

In eastern Nebraska about 80 to 90 percent of the infestations came from sweetclover fields and unplowed cornfields. Small grain sown in corn or sorghum stubble, which had been harrowed over or left standing, proved an important source of infestations for M. bivittatus. In some instances populations of 300 per square yard developed in these places. Other sources of infestations were the roadsides and other field margins, soddy banks of coulees, and alfalfa fields. The distribution of the species in this area is described by Lindsay as follows: "In west-central Iowa the infestation was predominantly M. bivittatus, with occasional areas where M. mexicanus was dominant; in northwestern Missouri the infestation was negligible; in eastern Nebraska M. bivittatus predominated in some localities and M. differentialis in others. Later, M. differentialis became the most important in all but the northeastern counties. The M. bivittatus infestation in Nebraska extended into south-central South Dakota, notably in Tripp, Gregory, and Charles Mix Counties, thence eastward in reduced numbers, where it was combined with M. differentialis. Just north of these counties there was a general infestation of M. mexicanus. In southwestern Minnesota only one small infestation was encountered, occurring in Rock County and first consisting of M. bivittatus and M. differentialis mixture, but following a severe hail and hatch of M. femur-rubrum it became predominantly M. mexicanus and M. femur-rubrum. The latter species also increased in importance in northwestern Iowa."

Dissosteira longipennis Area

This area included southeastern Colorado, southwestern Kansas, Panhandles of Oklahoma and Texas, and the northeastern part of New Mexico. The survey supervisors for this area were L. A. Spain and D. K. Scharff, and the following discussion is based on their observations.

Mr. Spain reports: "That portion of the Great Plains embodying the D. longipennis outbreak might be considered as an area of considerable diversity, from the aspect of topography, and as one of much similarity, from the standpoint of natural vegetation. For the most part, the terrain is slightly rolling, short-grass rangeland, called the plains grassland, varying from level plains on the east to the more rough hill land with buttes and mesas on the west. Soils are predominantly sand and clay loams with very little organic matter. In the longipennis region of the short grass or plains grassland, the natural grass is principally a mixture of grama (Bouteloua gracilis) and buffalo grass (Buchloe dactyloides). Wire grass (Aristida longiseta) appears in the flora in the eastern edge of the D. longipennis area, and along the western edge admixtures of ring grass (Muhlenbergia torreyi) and junegrass (Koeleria cristata) appear. Toward the southwest in New Mexico black grama (Bouteloua eriopoda) becomes more and more abundant until it is the dominant species at the margin of the infestation. Other grasses of a more or less local nature contribute variation to the flora but the general dominance of grama-buffalo grass is characteristic of the D. longipennis area. It is estimated that more than 90 percent of the D. longipennis infestation of 1939 hatched from range and pasture land where these short grasses were dominant.

The extent of farming in the area is variable by counties and involves from nearly 15 percent of the land in some counties to 75 percent or more in others, with an estimate of about one-fourth or one-third of the D. longipennis area under cultivation. Wheat and grain sorghums are prevalent and the following is a list of the chief crops: (1) Small grains, principally winter wheat with small acreages of barley and spring wheat; (2) sorghums, principally grain sorghums, including Kafir corn, Milo maize, Sudan grass, and cane; (3) corn; (4) legumes. Along the rather narrow creeks and strips of river-bottom land where irrigation is possible, there are small fields of alfalfa, sweetclover, peas, and beans, also small grains, corn sorghums, melons, and vegetables. Irrigation is very limited, as streams are not permanent in most of the southern part of the D. longipennis area and over much of the whole area. The Arkansas River and several of its tributaries provide irrigation water for adjacent land in Colorado and Kansas. This is the principal irrigated section of the D. longipennis area. Most of this area has received an average annual precipitation of 15 to 20 inches and in recent years of abnormal drought was included in the well-known 'dust-bowl.'

"Although known as the D. longipennis area, in honor of the most important species, Melanoplus differentialis, M. mexicanus, M. bivittatus, Aeoloplus turnbullii and other species were the dominant grasshoppers in crop land. A second generation of M. mexicanus became sufficiently numerous to warrant special attention late in the summer and in the fall. Eggs of D. longipennis were found in all environments common to grasshopper oviposition. However, egg beds of this species were not scattered promiscuously, for it is estimated that more than 90 percent of the egg beds occurred in range and in pastures covered with buffalo and grama grass. There were a few beds in tall native grass and weedy grassland, several in small grain, sorghum, and corn stubble, and some in abandoned land. On typical beds in buffalo-grama range, egg pods were placed around the edges of grass plants, and in the intervening bare spots between plants well below the surface of the soil.

"A total of 75 D. longipennis egg beds were examined during the spring of 1939 in Colorado, Texas, and New Mexico. The following table shows the average results of the examination of typical beds in the heavily infested portion of the area.

Table 6.--D. longipennis egg beds surveyed in the spring of 1939 in Colorado, New Mexico, and Texas

State	Beds surveyed	Average size of beds	Pods per square foot	Reduction by predators
	Number	Acres	Number	Percent
Colorado - - - -	38	25	5.3	9.6
New Mexico - - -	23	5	6.3	15.0
Texas- - - - - -	14	5	6.6	10.0

"Egg beds ranged in size from 1/2 acre to 200 acres, with an average of approximately 15 acres per egg bed for the D. longipennis area. The average egg pod population of 75 beds ranged from 0.7 pod to 20 pods per square foot, with an average of nearly 5.8 pods per square foot. The first hatching dates for D. longipennis, together with the average duration of the hatching period, are shown for each of the major D. longipennis States in table 7.

Table 7.--Dates of hatching periods for New Mexico, Texas, and Colorado in 1939

State	First hatch	Hatching complete	Average duration of hatching period
			Days
New Mexico - - -	April 21	June 5	23
Texas - - - - -	April 22	May 30	23
Colorado - - - -	May 2	June 1	18

"The duration of the hatching period for individual beds ranged from 11 to 30 days. The shorter average hatching period of 18 days for Colorado compared with 23 days for New Mexico and Texas is attributed to weather. Eggs began to hatch at a number of beds in the two last-named States as the result of an unseasonably warm spell during the latter part of April; then followed cool weather in the first half of May, which prolonged the hatching period. Hatching was deferred on a number of beds in Colorado by the same cool spell until warm weather prevailed, when a quick hatch resulted. Egg beds at lower altitudes, in warm exposures, began to hatch 19 days earlier than did some of the beds situated less favorably on high mesas. An egg bed in Lincoln County, Colo., which had both a southern and a northern exposure, exemplifies the effect of a favorable location. When hatching was complete on the southern slope of this bed, only 55 percent of the eggs had hatched on the northern exposure.

"The proportion of viable eggs for all the beds was large, and the few eggs which did not hatch constituted only 1 percent or less. The length of the nymphal period for D. longipennis is shown in table 8. The time interval is measured from the first hatching to the first appearance of adults.

Table 8.--Summary of the length of the nymphal period for New Mexico, Texas, and Colorado, in 1939

State	First hatch	First adults	Length of nymphal period
			Days
New Mexico - - -	April 21	June 5	45
Texas - - - - -	April 22	June 5	44
Colorado - - - -	May 2	June 15	44

"D. longipennis persisted in bands throughout the nymphal period, except in cases where populations were too low (either originally or as a result of control) to become gregarious. Populations of less than 5 per square yard were not observed to band together in Texas and New Mexico, whereas in Colorado populations of less than 20 per square yard were not observed to band together. This discrepancy probably represents the population range wherein D. longipennis may or may not become gregarious, depending on such factors as nymphal size, vegetation, topography, or weather. First-instar nymphs occurred in bands averaging 500 per square yard but sometimes numbering as many as 2,000 per square yard. A gradual dispersal and thinning in numbers took place during the whole of the nymphal period until the last instar, when the average per square yard ranged from less than 50 to 150. Nymphs remained on their hatching grounds more than a week in some cases, and on other beds left immediately after hatching. Usually migration began near the end of the first week of hatching, and the spread was rapid. First-instar nymphs traveled about 3 feet per minute, third-instar nymphs from 6 to 12 feet per minute, and the late instars 10 feet or more per minute. Bands of nymphs could be found moving in all directions during a single day and often within one locality. Because of repeated changes in direction, bands did not attain great distances, but some were known to have reached a distance of 2 to 3 miles from the place of hatching. Very often by the end of a week or 10 days after hatching began, nymphal bands occupied 10 times the area of their egg beds. Nymphs from a 1/2 acre bed in Texas spread over 30 acres in less than 2 weeks. Notwithstanding good control, the last-instar nymphs in Colorado were estimated to cover 5 times as much area as the original egg beds, and in parts of New Mexico fifth-instar nymphs covered nearly 10 times the area of the egg beds.

"The first adults D. longipennis in 1939 were found on June 5 in New Mexico and Texas, and on June 15 in Colorado. By July 1, in the first two States and by July 15 in Colorado, populations were more than 98 percent adult. New areas became infested as the moving bands of nymphs became adults. Nymphs in the process of molting were left scattered behind the bands and the newly emerged adults soon flew away. During the month following the first adult emergence, D. longipennis adults showed no evidence of the gregariousness exhibited by the nymphs, and dispersed on wing.

This period is described as the solitary period.[1/] First flights were short, low, and rather local, whereby adults moved from 25 to several hundred yards at a time, largely at an altitude of less than 50 feet. High dispersing flights followed, and the lights of many towns in the area attracted 'hoppers from the sky at night. As the adults began to congregate, short low flights were again observed and concentration points became sites for potential egg beds. The activity of adults from emergence to oviposition is summarized below.

Table 9.--Summary of adult activity in Colorado, New Mexico, and Texas in 1939

State	First adults	Solitary period	First congregation	First Oviposition
Colorado - - - -	June 15	31 days	July 16	August 1
New Mexico - - -	June 5	30 days	July 5	July 17
Texas - - - - -	June 5	June 5 on	None	August 10 (?)

"During the time designated as the solitary period, adults became so widely scattered and evenly distributed they could not be found more numerous than 1 per square yard, except in a few small areas. An area approximately 10 by 15 miles near Tucumcari, N. Mex., which in May had many roving bands of D. longipennis, contained on July 5 an average of 1 adult per square yard, and not more than 2 per square yard were found in any part of the area. Very few locations in Texas contained as many as 1 per square yard, and for the most part, adults averaged less than 1 per square rod. Oviposition began in 12 to 15 days after the adults began to congregate. D. longipennis failed to congregate in Texas, apparently because of the extremely low population, and remained scattered at the rate of less than 1 per square yard throughout the oviposition period. In Texas by August 10 the ovarian development of females indicated that oviposition had started. Long flights practically ceased when oviposition got under way. The average population of adult bands of D. longipennis was 20 per square yard. The results of the 1939 fall egg survey are summarized in the following tables.

1/ The term "solitary period" is offered by L. A. Spain to designate that portion of the adult period which precedes the usual congregation for oviposition. During this time the adults are scattered and do not show gregarious tendencies.

Table 10.--Egg beds of D. longipennis in Colorado and New Mexico in 1939

State	Egg beds	Average Size egg beds	Pods per square foot	Predators per square foot	
				Bee fly	Blister beetle
	Number	Acres	Number	Number	Number
Colorado - -	98	19.5	4.5	3.0	0.3
New Mexico -	101	2.5	5.6	.7	.3

Table 11.--Estimated infestation of D. longipennis in Colorado and New Mexico in 1939

State	Egg beds	Area of egg beds	Total area infested	Questionable area
	Number	Acres	Acres	Acres
Colorado - -	98	1910	164,000	137,700
New Mexico -	101	250	30,000	7,000

"Egg pod counts averaged from less than 1 per square foot to more than 17 per square foot. The 98 egg beds of Colorado were found in Otero, Lincoln, Las Animas, Pueblo, Cheyenne, and Adams Counties. In New Mexico the 101 egg beds were found in Quay and DeBaca Counties. The total infested area includes all the area over which the grasshoppers ranged during the laying season. The questionable area includes acreage in which D. longipennis was present during part of the laying season, but where no egg beds were found. Baca, Bent, Pueblo, Cheyenne, and Adams Counties of Colorado, and Chaves County, N. Mex., had questionable area."

Melanoplus occidentalis Area

In Nye and Lander Counties, Nev., there occurred an outbreak of Melanoplus occidentalis occidentalis Thos. The situation was covered by G. M. Shogren, who submitted the following information: "Prior to 1939 the range grasshopper (M. occidentalis occidentalis) was not known to exist in Nevada. Inquiry by the writer of local residents as to past infestations brought forth no reliable information. Some local ranchers seemed to remember a heavy grasshopper infestation on the range about 30 years ago. Indians say that 60 to 70 years ago a heavy range infestation occurred for two summers. The range was damaged heavily at this time and all deer left the country to seek grazing elsewhere. In July 1938, a flight of grasshoppers, presumably M. occidentalis occidentalis, settled over the buildings and fields of the Turner ranch in Big Smoky Valley. The next morning the 'hoppers took flight into the nearby hills and were not observed again by Mr. Turner. Late in the summer a flight of

grasshoppers appeared near Wall Canyon, 1 1/2 miles south of the H. Ott ranch. It is assumed that heavy egg deposition took place in this area, for in the spring of 1939 grasshopper nymphs were first observed here, and from all indications the infestations for 1939 arose from egg beds laid down in the vicinity of Wall Canyon. The flight that appeared at the Turner ranch in all probability was the same one that settled near Wall Canyon, as the two areas are only 8 to 9 miles apart. Information and observations made led the writer to believe that only one band of grasshoppers was present in Big Smoky Valley in 1938. Eggs are reported to have hatched during the second and third weeks in March, the spring of 1939 being an early one. The nymphs were very active and it was reported that they began to migrate during the early instars. Adult grasshoppers were observed on May 13 (10 percent of population) and on May 21 from 95 to 98 percent of the known populations were winged. Mating was reported on May 20, and egg laying observed to be taking place on June 1. Egg laying observed on June 1, was only a very small percentage of the local population. Egg laying was well under way by June 21. Egg deposition continued until the latter part of July, at which time very few surviving adults were found, natural mortality having reduced populations to this degree.

"The 1939 infestation spread from an area 2 by 3 miles in size on the low hills and knolls between Pablo and Wall Canyons to a total area of 90 by 15 miles. This latter area extended from Willow Springs maintenance station, Nye County, in the south, to 20 miles north of Route 50 in Lander County. In the 1939 fall egg survey there were 11 areas having a combined acreage of egg beds of 19,000 acres. Egg laying began around June 1 and continued until late in July. Most of the oviposition took place between 9 a.m. and 12 noon. Egg beds were fairly well defined and in most cases quite concentrated. The number of pods found per square foot ranged from less than 1 to 285. A distinct preference for gravelly and rocky soil was shown in that all egg beds were in this type of soil. The tops of knolls, low hills, alluvial fans at canyon mouths and sides of canyons were the topographic sites chosen for egg deposition; spots without southern or western exposuresof good drainage features were avoided for egg deposition."

Predators and Parasites in Relation to the 1939 Outbreak

During the egg survey in the spring of 1939 estimates were made of the damage done to eggs by egg predators and parasites. The average reduction of good eggs by predators amounted to 35 percent in eastern Wyoming and western Nebraska and South Dakota. Bee-fly larvae were the principal predators, with blister beetles second and carabids a minor third. In eastern Montana and western North Dakota the egg reduction amounted to 20 to 75 percent and was due mainly to the work of bee flies.

In southeastern South Dakota, northeastern Nebraska, and western Iowa, blister-beetle larvae were more important than the bee fly. In places of greatest egg reduction, carabid larvae outnumbered the blister beetle from 2 to 8 times. Mites, Trombidium sp., were also found throughout this

area, sometimes as many as 10 or 12 per pod. Later it was believed that some reduction in population was brought about by the effect of 10 to 36 seed mites on the wing pads of many of the nymphs, preventing proper molting.

The egg parasite Scelio calopteni Riley was also numerous in this area. Many counts of unhatched, hatched, and parasitized pods were made between May 26 and June 15. The amount of parasitization ranged from 1 to 60 percent, and for the whole area it averaged at least 5 percent.

In the Dissosteira longipennis area of Texas and New Mexico bee-fly, blister-beetle, and carabid larvae were seldom found, and the reduction of egg pods by these predators was less than 1 percent. Birds, principally western horned larks, and rodents--rats, mice and gophers-- were believed to have destroyed 15 percent of the D. longipennis pods in the egg beds of New Mexico and 10 percent in Texas. Western horned larks and lark buntings consumed about 5 percent of the first-and second-instar D. longipennis in Texas. After 85 to 95 percent of the hoppers had been destroyed by bait, these two birds destroyed up to 100 percent of the residual populations.

In Colorado the insect, bird, and mammal predators reduced the number of egg pods of D. longipennis 11 percent. Bee-fly larvae were the most important insect egg predator, while western horned larks destroyed only 1 percent of the eggs. During oviposition the swainson, red-shouldered and rough-legged hawks gathered in the vicinity of the egg beds, feeding on the adult grasshoppers. On 1 egg bed in 4 days' time, they reduced the adult population from 10 per square yard to less than 1 per square yard. Pellets of indigestible matter regurgitated by the hawks, showed as many as 15 to 19 grasshoppers per pellet. The fecal matter of skunks and coyotes showed that these 2 animals for a short period fed almost exclusively on D. longipennis adults. Sarcophagid parasitization averaged 2 to 3 percent during the adult period in the D. longipennis area. The cumulative effect probably exceeded the average parasitization because of at least 3 generations of sarcophagids occurring in this area. In the Melanoplus mexicanus area, 4 to 25 percent of the grasshoppers contained maggots of the flesh flies. Although conditions were ideal, especially in the M. mexicanus area, there was little or no reduction of numbers due to fungus.

ARKANSAS

This is the third year in which collections have been made in this State. Two hundred ninety-four were specimens taken in 5 habitats and 10 species were included in the collections. Melanoplus differentialis is the dominant species, with M. mexicanus second in numbers. Populations were mostly of noneconomic importance, and only 6 counties were listed as needing some control.

ARKANSAS

Distribution by species of 294 specimens collected in Arkansas, expressed in percentage of total number collected in each habitat

Species	Corn	Alfalfa	Lespedeza	Grassland	Soybeans	Total Specimens	Percentage of grand total
						Number	
Ageneotettix deorum Scudd.	--	--	1.07	--	--	1	0.34
Campylacantha o. olivacea Scudd.	--	--	3.22	6.90	--	7	2.38
Chortophaga viridifasciata Deg.	--	6.25	4.30	1.72	--	9	3.06
Hippiscus rugosus Scudd.	8.33	--	5.38	--	--	6	2.04
Melanoplus bispinosus Scudd.	--	--	7.53	--	--	7	2.38
M. differentialis Thos.	16.66	12.50	12.90	32.76	56.72	79	26.87
M. femur-rubrum Deg.	--	6.25	13.98	17.24	14.92	37	12.58
M. mexicanus Sauss.	--	39.06	17.20	3.45	14.92	53	18.03
Orphulella speciosa Scudd.	--	3.12	1.07	17.24	--	13	4.42
Schistocerca a. americana (Drury)	75.00	3.12	4.30	1.72	1.49	17	5.78
Nymphs	--	29.69	29.03	18.96	11.94	65	22.11
Total specimens per environment	12	64	93	58	67	294	--

ARKANSAS

The percentages of individuals of the various species present in Arkansas, arranged according to crops infested, are summarized as follows:

Corn	Percent
1. Schistocerca a. americana--	75
2. M. differentialis----------	17
3. Hippiscus rugosus----------	8
4. Other species and nymphs---	0

Alfalfa	Percent
1. Melanoplus mexicanus-------	39
2. M. differentialis----------	13
3. Chortophaga viridifasciata-	6
4. M. femur-rubrum------------	6
5. Orphulella speciosa--------	3
6. Schistocerca a. americana---	3
7. Nymphs---------------------	30

Lespedeza	
1. Melanoplus mexicanus-------	17
2. M. femur-rubrum------------	14
3. M. differentialis----------	13
4. M. bispinosus--------------	8
5. Hippiscus rugosus----------	5
6. 5 other species and nymphs-	43

Grassland	
1. Melanoplus differentialis---	33
2. M. femur-rubrum------------	17
3. Orphulella speciosa--------	17
4. Campylacantha o. olivacea---	7
5. M. mexicanus---------------	3
6. 2 other species and nymphs-	23

Soybeans	
1. Melanoplus differentialis---	57
2. M. femur-rubrum------------	15
3. M. mexicanus---------------	15
4. Schistocerca a. americana---	1
5. Nymphs---------------------	12

Grand total	
1. Melanoplus differentialis---	27
2. M. mexicanus---------------	18
3. M. femur-rubrum------------	13
4. Schistocerca a. americana---	6
5. Orphulella speciosa--------	4
6. 5 other species and nymphs-	32

COLORADO

This is the fifth year in which collections have been made in Colorado. There were 10,135 specimens collected in 9 environments in the cropland on the plains and 8 habitats classified according to elevation above sea level. These elevations are listed as "below 5,000 feet," "5,000 to 7,000 feet," "7,000 to 9,000 feet," "9,000 to 11,000 feet," and "above 11,000 feet." The highest elevations were the summits of Pikes Peak and Mount Evans, with altitudes of over 14,000 feet. Altogether, 73 species were represented in the collections for the entire State.

Several outstanding facts are brought out in the collections for this State. In the first place, it was done systematically and the results show a perfect distribution of species as would be expected according to habitats found in the cropped areas of the plains. As an example, Melanoplus mexicanus was dominant in the small grain, but far more so in the dry-land grain than in the irrigated crop. It was also the most numerous in sorghums and idle land and was about equal with M. bivittatus in beans. Melanoplus femur-rubrum was the dominant species in alfalfa and along field margins, which is to be expected. In the corn M. differentialis was dominant, with M. bivittatus second and M. femur-rubrum third, the three together forming 94 percent of the population. M. mexicanus was fourth, forming only 2 percent. Between the dry-land and irrigated small grain, neither M. bivittatus, M. differentialis, nor M. femur-rubrum appeared among the first five most important species in the dry land but in the irrigated section, they were second, third, and fifth, respectively. These three species were also the first three most important species in the field margins in the order just named. Other than the dry-land grain and idle land, the crops listed here, including the margins, are largely under irrigation. Therefore, the segregation of the records on the basis of dry land and irrigated land definitely divides the grasshopper infestations into almost a pure M. mexicanus infestation for the former and a mixture of M. bivittatus, M. differentialis, M. femur-rubrum, and M. mexicanus for the latter.

In the classification according to elevation above sea level, it may be noted that no Camnula pellucida occured below 5,000 feet, and reached its greatest importance on the range land between 7,000 and 9,000 feet, where it was the dominant species. It was also second in numbers in the alfalfa and small grain in this range of altitude and on range land between 9,000 and 11,000 feet. This species did not appear in any numbers at lower altitudes of the plains, woodland, or prairie, except in the more northern latitudes of the northern parts of Michigan, Wisconsin, Minnesota, and North Dakota. It is confined largely to the mountain and low mountain areas of the west.

One of the most enlightening facts is that Melanoplus mexicanus was by far the dominant species collected above 11,000 feet elevation, forming 62 percent of the 531 specimens collected at these altitudes. Some of these collections were made on the summits of Mount Evans and Pikes Peak--above 14,000 feet--and mexicanus was the dominant species.

They may have flown up to these heights. Aeropedellus clavatus Thos. and Melanoplus dodgei Thos. were perhaps the two most important native species of these highest altitudes, although this is not definitely known.

In the Dissosteira longipennis area, this species has decreased sharply in numbers. In the 1939 fall egg survey, only 100 known egg beds, totaling 1,910 acres in area, were located. This involved some 164,000 acres altogether in 6 counties--Adams, Cheyenne, Las Animas, Lincoln, Otero, and Pueblo. In the western slope area there were 4 counties having heavy local infestations in the irrigated sections, with M. bivittatus the dominant species.

Distribution by species of 5,393 specimens collected in various habitats of the cultivated areas of the plains region of Colorado, expressed in percentage of total numbers collected in each habitat

Species	Dry-land grain	Irrigated grain	Alfalfa	Corn	Sorghums	Sugar beets	Beans	Idle land	Field margins	Total specimens	Percentage of grand total
										Number	
Aeoloplus turnbullii Thos.	2.33	—	0.26	—	—	1.61	—	0.95	0.85	39	1.28
Aeoloplus turnbullii bruneri Caud.	7.23	0.94	.43	—	2.21	—	—	2.43	1.59	91	1.30
Aeropedellus clavatus Thos.	—	—	—	—	—	—	—	—	—	—	1.42
Ageneotettix deorum Scudd.	—	1.89	.34	—	—	—	—	.27	1.32	39	2.17
Amphitornus coloradus Thos.	—	—	.17	—	—	—	—	—	.11	4	.44
Arphia p. pseudonietana Thos.	—	—	—	—	—	—	—	—	.11	2	.22
Aulocara elliotti Thos.	.70	2.60	.43	—	—	—	—	.27	.11	23	.77
Boopedon nubilum Say	—	—	—	—	—	—	—	—	—	—	.13
Camnula pellucida Scudd.	—	—	—	—	—	—	—	—	—	—	3.77
Chortippus longicornis Latr.	—	—	—	—	—	—	—	—	1.28	24	.85
Circotettix rabula altior Rehn.	—	—	—	—	—	—	—	—	—	—	.04
Circotettix rabula rabula R. & H.	—	—	—	—	—	—	—	—	—	—	.05
Cordillacris crenulata Brun.	—	—	—	—	—	—	—	—	—	—	.03
C. occipitalis cinerea Brun.	—	—	—	—	—	—	—	—	—	—	.04
C. o. occipitalis Thos.	—	—	—	—	—	—	—	—	—	—	.02
Dactylotum pictum Thos.	—	—	—	—	—	—	—	—	—	—	.01
Derotmema haydenii Thos.	.47	.23	—	—	—	—	—	—	—	3	.21
Dissosteira carolina L.	.70	1.42	.26	1.01	1.47	—	2.14	.68	—	25	.37
Dissosteira longipennis Thos.	1.86	.47	—	—	—	—	.71	—	.16	14	.32
Drepanopterna femoratum Scudd.	—	—	—	—	—	—	—	—	—	—	.49
Encoptolophus sordidus costalis Scudd.	—	1.42	.09	—	—	—	—	—	.11	9	.82
Hadrotettix trifasciatus Say	.70	.23	—	—	.74	—	—	.95	.05	13	.48
Heliaula rufa Scudd.	—	—	—	—	—	—	—	—	—	—	.04
Hesperotettix speciosus Scudd.	—	.23	—	—	.74	—	—	.14	2.18	44	1.11
Hesperotettix viridis pratensis Scudd.	—	—	—	—	—	—	—	—	.27	5	.06
Hesperotettix viridis Thos.	—	—	—	—	—	—	—	—	.53	10	1.11
Hippiscus rugosus Scudd.	—	—	—	—	—	—	—	—	.11	2	.06
Hypochlora alba Dodge	—	—	—	—	—	—	—	—	—	—	.05

COLORADO (1)--Continued

Species	Dry-land grain	Irrigated grain	Alfalfa	Corn	Sorghums	Sugar beets	Beans	Idle land	Field margins	Total specimens	Percentage of grand total
										Number	
Leprus cyaneus Ckll.	--	--	--	--	--	--	--	--	--	--	0.03
Melanoplus a. angustipennis Dodge	3.26	0.71	1.46	--	--	--	1.43	4.32	2.87	122	2.45
Melanoplus bivittatus Say	.23	8.98	12.05	35.14	13.24	25.61	25.00	3.65	14.88	691	8.04
Melanoplus borealis monticola Scudd.	--	--	--	--	--	--	--	--	--	--	.01
Melanoplus b. bowditchi Scudd.	--	--	--	--	--	--	--	.27	1.49	30	.69
Melanoplus bruneri Scudd.	--	--	--	--	--	--	--	--	--	--	.04
Melanoplus dawsoni Scudd.	--	--	--	--	--	--	--	--	--	--	.34
Melanoplus differentialis Thos.	1.40	6.86	11.62	47.64	18.38	35.48	11.43	4.05	12.07	675	7.48
Melanoplus dodgei Thos.	--	--	--	--	--	--	--	--	--	--	.20
Melanoplus fasciatus Walk.	--	--	--	--	--	--	--	--	--	--	.02
Melanoplus femur-rubrum Deg.	--	6.38	30.20	11.49	5.88	21.51	12.86	.95	28.81	1027	12.53
Melanoplus flavidus Scudd.	.47	1.18	.34	--	.74	--	--	3.24	.37	43	.80
Melanoplus foedus fluviatilis Brun.	--	--	--	--	--	--	--	--	--	--	.01
Melanoplus foedus foedus Scudd.	5.83	6.62	2.24	.34	.74	--	12.14	17.16	3.35	288	4.03
Melanoplus gladstoni Scudd.	1.17	--	.09	--	--	--	--	.27	.05	9	.34
Melanoplus infantilis Scudd.	.23	--	--	--	--	--	--	--	--	1	.87
Melanoplus keeleri luridus Dodge	--	--	--	--	--	--	--	--	.27	5	.13
Melanoplus lakinus Scudd.	.93	5.67	3.27	.34	3.68	--	6.43	2.30	1.54	127	2.09
Melanoplus mexicanus Sauss.	62.94	43.26	27.37	2.36	38.23	15.05	25.71	37.16	11.70	1389	26.30
Melanoplus occidentalis Thos.	--	--	.09	--	--	--	--	.41	--	4	.67
Melanoplus packardii Scudd.	6.99	6.38	2.66	1.01	7.35	.53	1.43	10.00	1.70	210	4.00
Melanoplus regalis Dodge	--	--	--	--	--	--	--	--	--	--	.02
Mermiria maculipennis macclungi Rehn	--	1.65	--	--	--	--	--	.13	2.13	48	1.07
Mestobregma plattei plattei Thos.	--	--	--	--	--	--	--	--	--	--	.11
Metator pardalinus Sauss.	--	--	--	--	.73	--	--	--	.16	4	.09
Opeia obscura Thos.	--	--	--	--	--	--	--	--	.11	2	.36
Orphulella pelidna Burm.	--	--	--	--	--	--	--	--	.11	2	.85
Orphulella speciosa Scudd.	--	--	--	--	--	--	--	--	--	--	.10
Pardalophora haldemanii Scudd.	--	--	--	--	--	--	--	--	--	--	.01
Paropomalo wyomingensis Thos.	--	--	--	--	--	--	--	--	.32	6	.10
Phlibostroma quadrimaculatum Thos.	--	--	--	--	--	--	--	--	--	--	.27
Phoetaliotes nebrascensis Thos.	--	--	--	--	--	--	--	--	.21	4	.60

Species	Dry-land grain	Irri-gated grain	Al-falfa	Corn	Sor-ghums	Sugar beets	Beans	Idle land	Field margin	Total speci-mens	Percent age of grand total
										Number	
Schistocerca lineata Scudd.	--	--	--	0.68	--	--	--	0.27	2.71	55	0.59
Spharagemon collare Scudd.	1.39	2.84	0.86	--	--	--	0.71	6.49	1.17	99	1.34
Spharagemon equale Say	.93	--	.09	--	--	--	--	.13	.05	7	.17
Spharagemon humile morse	--	--	--	--	--	--	--	--	--	--	.07
Trachyrhachis kiowa kiowa Thos.	--	--	--	--	--	--	--	--	--	--	.51
Trimerotropis campestris McNeill	--	--	--	--	--	--	--	--	--	--	.14
Trimerotropis cincta Thos.	--	--	--	--	--	--	--	--	--	--	.04
Trimerotropis laticincta Sauss.	--	--	.09	--	1.47	--	--	1.22	--	12	.18
Trimerotropis pallidipennis Burm.	--	--	--	--	--	--	--	--	--	--	.01
Trimerotropis p. salina McN.	--	--	--	--	--	--	--	--	--	--	.07
Trimerotropis suffussus Scudd.	--	--	--	--	--	--	--	--	--	--	.05
Tropidolophus formosus Say	--	--	--	--	--	--	--	.68	--	5	.05
Xanthippus corallipes Hald.	--	--	.09	--	--	--	--	--	--	1	.01
Nymphs	.23	--	5.50	--	3.68	--	--	1.62	5.10	178	4.28
Undetermined	--	--	--	--	.73	--	--	--	.05	2	.10
Total specimens per environment	429	423	1,162	296	136	186	140	740	1,881	5,393	--

Distribution by species of 4,742 specimens collected at various elevations (in feet) in Colorado, expressed in percentage of total number collected in each habitat

Species	River-bottom plains	Range below 5,000	Range, 5,000-7,000	Crop, 5,000-7,000	Crop, 7,000-9,000	Range, 7,000-9,000	Range, 9,000-11,000	Range above 11,000	Total specimens
									Number
Aeoloplus turnbullii Thos.	3.91	1.74	0.36	10.09	--	--	--	--	91
Aeoloplus turnbullii bruneri Caud.	1.82	3.48	--	--	--	--	--	--	41
Aeropedellus clavatus Thos.	--	.17	--	--	--	0.12	6.56	24.29	144
Ageneotettix deorum Scudd.	1.04	5.05	16.42	.61	--	.37	--	--	181
Amphitornus coloradus Thos.	1.04	1.39	1.34	--	--	.50	3.03	--	41
Arphia p. pseudonietana Thos.	.43	--	.86	--	0.30	.87	--	--	20
Aulocara elliotti Thos.	.43	3.31	2.31	.92	--	.87	--	.38	55
Boopedon nubilum Say	.26	--	1.22	--	--	--	--	--	13
Camnula pellucida Scudd.	--	--	.24	--	20.00	36.49	10.10	--	382
Chortippus longicornis Latr.	.52	--	--	--	.30	5.98	3.53	--	62
Circotettix rabula altior Rehn	--	--	--	--	--	--	.50	.56	4
Circotettix rabula rabula R. & H.	--	--	--	--	--	.50	.50	--	5
Cordillacris crenulata Brun.	--	.52	--	--	--	--	--	--	3
C. occipitalis cinerea Brun.	--	--	--	--	--	.50	--	--	4
C. occipitalis occipitalis Thos.	--	--	--	.61	--	--	--	--	2
Dactylotum pictum Thos.	--	--	.12	--	--	--	--	--	1
Derotmema haydenii Thos.	.26	1.57	.12	.30	.30	.50	--	--	19
Dissosteira carolina h.	.09	.17	.12	.92	1.19	.37	--	--	13
Dissosteira longipennis Thos.	.09	3.13	--	--	--	--	--	--	19
Drepanopterna femoratum Scudd.	.09	3.31	3.65	--	--	--	--	--	50
Encoptolophus sordidus costalis Scudd	4.95	.87	1.09	.92	--	--	--	--	74
Hadrotettix trifasciatus Say	--	2.96	.97	3.36	--	--	--	--	36
Heliaula rufa Scudd.	--	--	.49	--	--	--	--	--	4
Hesperotettix speciosus Scudd.	5.90	--	.12	--	--	--	--	--	69
Hesperotettix viridis Thos.	.09	2.96	7.78	.30	--	.25	9.09	--	103
Hesperotettix viridis pratensis	--	--	.12	--	--	--	--	--	1
Hippiscus rugosus Scudd.	.26	.17	--	--	--	--	--	--	4
Hypochlora alba Dodge	--	.17	.24	--	--	.25	--	--	5
Leprus cyaneus Ckll.	--	.17	--	--	--	--	--	.38	3
Melanoplus a. angustipennis	2.43	2.09	1.22	10.70	.30	3.24	7.07	--	126
Melanoplus bivittatus	3.21	.52	.85	4.59	8.95	3.24	3.03	--	124

Distribution by species of 4,742 specimens collected at various elevations in Colorado, expressed in percentage of total number collected in each habitat

Species	River-bottom plains	Range below 5,000	Range, 5,000 7,000	Crop, 5,000 7,000	Crop, 7,000 9,000	Range, 7,000 9,000	Range, 9,000 11,000	Range above 11,000	Total specimens
Schistocerca lineata Scudd.	0.26	0.35	--	--	--	--	--	--	5
Spharagemon collare Scudd.	.87	1.92	--	3.36	0.30	--	1.51	0.19	37
Spharagemon equale Say	--	.87	0.36	.30	.30	--	--	--	10
Spharagemon humile Morse	--	--	--	--	--	0.87	--	--	7
Trachyrhachis kiowa kiowa Thos.	.87	5.40	1.70	.30	--	.12	--	--	52
Trimerotropis campestris McN.	--	--	--	--	2.09	.87	--	--	14
Trimerotropis cincta Thos.	--	--	--	--	--	.50	--	--	4
Trimerotropis laticincta Sauss.	.26	.52	--	--	--	--	--	--	6
Trimerotropis pallidipennis Burm.	--	--	.12	--	--	--	--	--	1
Trimerotropis p. salina McNeill	.61	--	--	--	--	--	--	--	7
Trimerotropis suffussus Scudd.	--	--	--	--	--	.62	--	--	5
Nymphs	5.03	.52	3.16	2.45	11.64	10.46	14.65	1.69	256
Undetermined	.17	.52	--	--	--	.25	--	.19	8
Total specimens per environment	1,152	574	822	327	335	803	198	531	4,742

Distribution by species of 4,742 specimens collected at various elevations in Colorado, expressed in percentage of total number collected in each habitat

Species	River-bottom plains	Range below 5,000	Range 5,000 7,000	Crop 5,000 7,000	Crop 7,000 9,000	Range 7,000 9,000	Range 9,000 11,000	Range above 11,000	Total specimens
Melanoplus borealis monticola	--	--	--	--	--	0.12	--	--	1
Melanoplus b. bowditchi Scudd.	--	6.97	--	--	--	--	--	--	40
Melanoplus bruneri Scudd.	--	--	--	--	--	.50	--	--	4
Melanoplus dawsoni Scudd.	--	--	--	--	--	2.74	6.06	--	34
Melanoplus differentialis Thos.	6.60	.87	--	0.92	--	--	--	--	84
Melanoplus dodgei	--	--	--	--	--	--	1.01	3.39	20
Melanoplus fasciatus Walk.	--	--	--	--	--	--	1.01	--	2
Melanoplus femur-rubrum Deg.	15.71	--	0.97	1.53	7.46	2.74	1.01	.19	244
Melanoplus flavidus Scudd.	2.60	--	--	2.14	--	.12	--	--	38
M. foedus foedus Scudd.	5.03	6.79	--	5.81	.60	--	--	.56	121
Melanoplus foedus fluviatilis Brun.	.09	--	--	--	--	--	--	--	1
Melanoplus gladstoni Scudd.	.09	1.22	1.09	--	1.79	.37	--	--	26
Melanoplus infantilis Scudd.	--	1.92	.36	--	7.46	5.85	1.01	--	87
Melanoplus keeleri luridus Dodge	--	.35	.36	--	--	.37	--	--	8
Melanoplus lakinus Scudd.	6.60	.17	--	2.45	--	--	--	--	85
Melanoplus mexicanus Sauss.	10.76	25.26	33.09	36.39	34.63	16.44	21.72	61.77	1279
Melanoplus occidentalis Thos.	.09	1.57	.73	.30	1.19	.75	4.55	5.27	64
Melanoplus packardii Scudd.	2.60	3.83	9.73	10.70	1.19	1.24	4.55	1.13	196
Melanoplus regalis Dodge	--	.35	--	--	--	--	--	--	2
Mermiria maculipennis macclungi Rehn	4.60	.52	.49	--	--	.12	--	--	61
Mestobregma plattei plattei Thos.	--	.52	.24	--	--	.75	--	--	11
Metator pardalinus Sauss.	--	.70	.12	--	--	--	--	--	5
Opeia obscura Thos.	1.04	1.92	1.46	--	--	--	--	--	35
Orphulella p. pelidna Burm.	4.69	--	3.65	--	--	--	--	--	84
Orphulella speciosa Scudd.	.61	--	.36	--	--	--	--	--	10
Pardalophora haldemanii Scudd.	.09	--	--	--	--	--	--	--	1
Paropomala wyomingensis Thos.	--	.70	--	--	--	--	--	--	4
Phlibostroma quadrimaculatum Thos.	--	2.26	1.58	--	--	.12	--	--	27
Phoetaliotes nebrascensis Thos.	4.34	.17	.73	--	--	--	--	--	57

COLORADO

The percentages of individuals of the various species present in Colorado, arranged according to the common habitats, are summarized as follows:

River bottom plains	Percent
1. Melanoplus femur-rubrum	16
2. Melanoplus mexicanus	11
3. Melanoplus differentialis	7
4. Melanoplus lakinus	7
5. Hesperotettix speciosus	6
6. 34 other spp. and undet.	48
7. Nymphs	5

Rangeland, below 5,000 feet	Percent
1. Melanoplus mexicanus	25
2. Melanoplus b. bowditchi	7
3. Melanoplus f. foedus	7
4. Trachyrhachisk. kiowa	5
5. Ageneotettix deorum	5
6. 37 other spp. and undet.	50
7. Nymphs	1

Range, 5,000 to 7,000 feet	
1. Melanoplus mexicanus	33
2. Ageneotettix deorum	16
3. Melanoplus packardii	10
4. Hesperotettix viridis	8
5. Drepanopterna femoratum	4
6. Orphulella p. pelidna	4
7. 32 other species	22
8. Nymphs	3

Crop, 5,000 to 7,000 feet	
1. Melanoplus mexicanus	36
2. Melanoplus packardii	11
3. Melanoplus a. angustipennis	11
4. Aeoloplus turnbullii	10
5. Melanoplus foedus foedus	6
6. 17 other species	23
7. Nymphs	3

Crop, 7,000 to 9,000 feet	
1. Melanoplus mexicanus	35
2. Camnula pellucida	20
3. Melanoplus femur-rubrum	7
4. Melanoplus infantilis	7
5. Trimerotropis campestris	2
6. 10 other species	17
7. Nymphs	12

Range, 7,000 to 9,000 feet	
1. Camnula pellucida	36
2. Melanoplus mexicanus	16
3. Chortippus longicornis	6
4. Melanoplus infantilis	6
5. Melanoplus dawsoni	3
6. Melanoplus femur-rubrum	3
7. 25 other species and undet.	20
8. Nymphs	10

Range, 9,000 to 11,000 feet	
1. Melanoplus mexicanus	22
2. Camnula pellucida	10
3. Hesperotettix viridis	9
4. Melanoplus angustipennis	7
5. Aeropedellus clavatus	7
6. 13 other species	30
7. Nymphs	15

Range, 11,000 to 14,000 feet	
1. Melanoplus mexicanus	62
2. Aeropedellus clavatus	24
3. Melanoplus occidentalis	5
4. Melanoplus dodgei	3
5. Melanoplus packardii	1
6. 6 other species	3
7. Nymphs	2

Dry-land grain	
1. Melanoplus mexicanus	63
2. Aeoloplus turnbullii bruneri	7
3. Melanoplus packardii	7
4. Melanoplus f. foedus	6
5. Melanoplus a. angustipennis	3
6. 14 other species	14

Irrigated grain	
1. Melanoplus mexicanus	43
2. Melanoplus bivittatus	9
3. Melanoplus differentialis	7
4. Melanoplus f. foedus	7
5. Melanoplus femur-rubrum	6
6. Melanoplus packardii	6
7. 14 other species	22

COLORADO (Continued)

Alfalfa	Percent
1. Melanoplus femur-rubrum	30
2. Melanoplus mexicanus	27
3. Melanoplus bivittatus	12
4. Melanoplus differentialis	12
5. Melanoplus lakinus	3
6. 17 other species	11
7. Nymphs	5

Corn	Percent
1. Melanoplus differentialis	48
2. Melanoplus bivittatus	35
3. Melanoplus femur-rubrum	11
4. Melanoplus mexicanus	2
5. Dissosteira carolina	1
6. Melanoplus packardii	1
7. 3 other species	2

Sorghums	
1. Melanoplus mexicanus	38
2. Melanoplus differentialis	18
3. Melanoplus bivittatus	13
4. Melanoplus packardii	7
5. Melanoplus femur-rubrum	6
6. 9 other species	14
7. Nymphs	4

Sugar beets	
1. Melanoplus differentialis	35
2. Melanoplus bivittatus	26
3. Melanoplus femur-rubrum	21
4. Melanoplus mexicanus	15
5. Aeoloplus turnbullii	2
6. Melanoplus packardii	1

Beans	
1. Melanoplus mexicanus	26
2. Melanoplus bivittatus	25
3. Melanoplus femur-rubrum	13
4. Melanoplus foedus foedus	12
5. Melanoplus differentialis	11
6. 6 other species	11
7. Nymphs	2

Idle land	
1. Melanoplus mexicanus	37
2. Melanoplus foedus foedus	17
3. Melanoplus packardii	10
4. Spharagemon collare	6
5. Melanoplus a. angustipennis	4
6. 20 other species	24
7. Nymphs	2

Field margins	
1. Melanoplus femur-rubrum	29
2. Melanoplus bivittatus	15
3. Melanoplus differentialis	12
4. Melanoplus mexicanus	12
5. Melanoplus foedus foedus	3
6. 30 other species	24
7. Nymphs	5

Grand total	
1. Melanoplus mexicanus	26
2. Melanoplus femur-rubrum	12
3. Melanoplus bivittatus	8
4. Melanoplus differentialis	7
5. Melanoplus foedus foedus	4
6. 68 other species	39
7. Nymphs	4

IDAHO

This was the second year in which collections have been made in typical environments in Idaho during the adult survey. A total of 2,911 specimens were collected in 4 different habitats and 20 species were represented in the collections.

Melanoplus mexicanus was the dominant species in 3 out of 4 of the habitats, but M. femur-rubrum was the most numerous in alfalfa and in the total number collected. Alfalfa is the most favorable place for grasshoppers and this is the reason that M. femur-rubrum was dominant for collections in the State as a whole. Infestations for the State as a whole were light and scattered. Only two counties which are likely to need as much as 25 and 30 tons of bait for control.

Distribution by species of 2,911 specimens collected in Idaho, expressed in percentage of total number collected in each habitat

Species	Small grain	Alfalfa	Field margin	Idle land	Total specimens	Percentage of grand total
Agencotettix deorum Scudd.---	--	--	0.23	--	2	0.07
Amphitornus coloradus Thos.--	0.38	---	--	--	1	.03
Arphia pseudonietana Thos.---	.38	0.07	.23	0.24	5	.17
Aulocara elliotti Thos.------	1.89	.07	.35	--	9	.31
Camnula pellucida Scudd.-----	.76	---	.46	--	6	.30
Chortippus longicornis Latr.-	--	--	.46	.24	5	.17
Conozoa wallula Scudd.-------	--	.14	.23	--	4	.14
Dissosteira carolina L.------	1.51	.22	1.28	1.20	23	.79
Drepanopterna femoratum Scudd.	--	--	.23	---	2	.07
Hesperotettix viridis Thos.--	.38	--	.35	---	4	.14
Melanoplus bivittatus Say----	.76	2.92	6.39	.72	100	3.43
M. dawsoni Scudd.-----------	--	.51	--	.24	8	.27
M. femur-rubrum Deg.---------	20.07	56.02	30.43	41.69	1,256	43.15
M. foedus foedus Scudd.------	7.20	2.19	9.06	1.44	133	4.57
M. infantilis Scudd.---------	.76	.07	--	--	3	.10
M. keeleri luridus (Dodge)---	--	--	.46	--	4	.14
M. mexicanus Sauss.----------	57.20	30.85	44.60	45.06	1,145	39,33
Oedaleonotus enigma Scudd.---	--	--	.23	--	2	.07
Phoetaliotes nebrascensis Thos.	7.20	.87	3.14	8.91	95	3.26
Spharagemon equale Say-------	--	.07	---	--	1	.03
Trimerotropis p. pallidipennis	.38	--	--	--	1	.03
Nymphs----------	1.14	5.98	1.86	.24	102	3.50
Total specimens per environment----------	264	1,371	861	415	2,911	--

IDAHO

The percentages of individuals of the various species present in Idaho, arranged according to crops infested, are summarized as follows:

Small grain	Percent
1. Melanoplus mexicanus	57
2. M. femur-rubrum	20
3. M. foedus foedus	7
4. Phoetaliotes nebrascensis	7
5. Aulocara elliotti	2
6. 8 other species and nymphs	7

Alfalfa	Percent
1. Melanoplus femur-rubrum	56
2. M. mexicanus	31
3. M. bivittatus	3
4. M. foedus foedus	2
5. Phoetaliotes nebrascensis	1
6. 7 other species and nymphs	7

Field margin	
1. Melanoplus mexicanus	45
2. M. femur-rubrum	30
3. M. foedus foedus	9
4. M. bivittatus	6
5. Phoetaliotes nebrascensis	3
6. 11 other species and nymphs	7

Idle land	
1. Melanoplus mexicanus	45
2. M. femur-rubrum	42
3. Phoetaliotes nebrascensis	9
4. Dissosteira carolina	1
5. M. foedus foedus	1
6. 4 other species and nymphs	2

Grand total	Percent
1. Melanoplus femur-rubrum	43
2. M. mexicanus	39
3. M. bivittatus	3
4. M. foedus foedus	5
5. Phoetaliotes nebrascensis	3
6. 16 other species and nymphs	7

ILLINOIS

This is the second year in which collections have been made in this State during the adult survey. A total of 6,065 specimens were collected in 6 habitats, and 28 species of Acrididae were included in the collections. Melanoplus femur-rubrum was the dominant species; M. mexicanus was second; M. differentialis was third. The Tettigoniidae or long-horned grasshoppers, were abundant in the collections, and the family as a whole was second in numbers to M. femur-rubrum. There was little change in the relative abundance of the different species from 1938 to 1939. Infestations in the State are low.

ILLINOIS

Distribution by species of 6,065 specimens collected in Illinois, expressed in percentage of total number collected in each habitat

Species	Small grain	Roadside	Pasture	Legumes	Idle land	Tame hay	Total specimens	Percentage of grand total
							Number	
Ageneotettix deorum	0.17	0.11	0.24	--	2.26	--	23	0.38
Arphia sulphurea F.	--	.11	--	--	--	--	1	.02
Arphia xanthoptera Burm.	.09	.22	.12	--	1.13	0.17	14	.23
Campylocantha olivacea Scudd.	.43	.22	.06	--	.14	--	9	.14
Chortippus longicornis	.09	--	--	--	--	--	1	.02
Chortophaga viridifasciata (Deg.)	2.08	4.67	1.39	0.19	.99	.51	102	1.68
Dichromorpha viridis Scudd.	.17	.54	.12	--	.14	.17	11	.18
Dissosteira carolina	.09	.98	.06	.10	.56	--	16	.26
Encoptolophus s. sordidus (Burm.)	.35	.43	.42	.19	.28	.34	21	.35
Hesperotettix viridis pratensis	.09	--	--	--	.14	--	2	.04
Hippiscus rugosus	.09	.76	.79	--	.99	.34	30	.49
Melanoplus angustipennis (Dodge)	.35	1.41	--	.10	3.39	--	42	.69
M. bivittatus	--	--	.06	.10	.28	--	4	.07
M. differentialis	3.81	10.43	.67	13.58	5.93	1.72	345	5.69
M. femur-rubrum	23.03	13.69	20.82	25.43	5.37	51.80	1342	22.13
M. flavidus	--	--	.18	--	.42	--	6	.10
M. keeleri luridus	--	--	.06	.19	--	--	3	.05
M. mexicanus	14.98	6.63	5.08	5.74	5.23	6.86	455	7.50
Merriria maculipennis macclungi	.09	.11	--	--	--	--	2	.04
Orphulella speciosa	.35	.33	4.78	.67	.85	1.37	107	1.76
Pardalophora phoenicoptera Burm.	--	.11	--	--	--	--	1	.02
Phoetaliotes nebrascensis	--	--	--	--	.14	--	1	.02
Psinidia f. fenestralis Serv.	.09	--	--	--	.14	--	2	.03
Schistocerca alutacea Harr.	--	--	.12	.29	1.41	--	15	.25
S. americana americana (Drury)	1.13	1.09	.48	.76	.14	.51	43	.71
Spharagemon collare	--	.11	--	--	.56	--	5	.08
Syrbula admirabilis Uhl.	--	2.83	2.42	1.05	2.12	1.72	102	1.68
Tettigoniidae	12.81	20.54	13.62	14.72	18.78	13.72	929	15.32
Trachyrhachis kiowa fuscifrons Stal	--	.76	.42	--	.85	.34	22	.36
Trimerotropis citrina Scudd.	--	--	--	--	.71	--	5	.08
Nymphs	39.74	34.02	48.06	36.90	47.03	20.41	2404	39.64
Total specimens per environment	1,155	921	1,652	1,046	708	583	6,065	--

ILLINOIS

The percentages of individuals of the various species present in Illinois, arranged according to crops infested, are summarized as follows:

Small grain	Percent
1. Melanoplus femur-rubrum	23
2. Melanoplus mexicanus	15
3. Tettigoniidae	13
4. Melanoplus differentialis	4
5. Chortophaga viridifasciata	2
6. 14 other species	3
7. Nymphs	40

Roadside	Percent
1. Tettigoniidae	21
2. Melanoplus femur-rubrum	14
3. Melanoplus mexicanus	7
4. Chortophaga viridifasciata	5
5. Syrbula admirabilis	3
6. 16 other species	16
7. Nymphs	34

Pasture	
1. Melanoplus femur-rubrum	21
2. Tettigoniidae	14
3. Melanoplus mexicanus	5
4. Orphulella speciosa	5
5. Syrbula admirabilis	2
6. 15 other species	5
7. Nymphs	48

Legumes	
1. Melanoplus femur-rubrum	25
2. Tettigoniidae	15
3. Melanoplus differentialis	14
4. Melanoplus mexicanus	6
5. Syrbula admirabilis	1
6. 13 other species	2
7. Nymphs	37

Idle land	
1. Tettigoniidae	19
2. Melanoplus differentialis	6
3. Melanoplus femur-rubrum	5
4. Melanoplus mexicanus	5
5. Melanoplus angustipennis	3
6. 20 other species	15
7. Nymphs	47

Tame hay	
1. Melanoplus femur-rubrum	52
2. Tettigoniidae	14
3. Melanoplus mexicanus	7
4. Melanoplus differentialis	2
5. Syrbula admirabilis	2
6. 8 other species	3
7. Nymphs	20

Grand total	Percent
1. Melanoplus femur-rubrum	22
2. Tettigoniidae	15
3. Melanoplus mexicanus	7
4. Melanoplus differentialis	6
5. Orphulella speciosa	2
6. 25 other species	8
7. Nymphs	40

IOWA

This is the fifth year in which collections have been made in Iowa during the adult grasshopper survey. In this 1939 survey 2,577 specimens were collected in 7 major environments, with 24 species represented in the collections. The dominant species in the collections from 5 out of 7 habitats was Melanoplus femur-rubrum, with M. mexicanus second in numbers. Nymphs, probably M. femur-rubrum, were numerous. M. differentialis was dominant in corn and sorghum; M. mexicanus in red clover. The order of importance based on numbers was the same as in 1938 for the 5 highest ranking species. Collections were made so late in the summer that many M. bivittatus adults were probably missed, as this species finished its life cycle early.

Only 17 counties, in the west-central and north-western parts, out of the 99 counties in the State, may need some control work in 1940. The most severe infestations are along field margins, and considerable damage to crops was noted in the adult survey. The normally heavy rainfall, however, acts as a decided check on the development of infestations in this State and only drought brings on grasshopper trouble.

IOWA

Distribution by species of 2,577 specimens collected in Iowa, expressed in percentage of total number collected in each habitat

Species	Corn and sorghum	Soybeans	Red clover	Alfalfa and sweet-clover	Small grain	Woody pasture	Field margins	Total specimens	Percent of gra total
								Number	
Ageneotettix deorum	--	--	--	2.74	4.43	4.39	3.00	77	2.99
Brachystola magna Girard	--	--	--	--	--	.49	.15	3	.12
Chortippus longicornis	--	--	--	--	--	--	.15	1	.04
Chortophaga viridifasciata (Deg.)	--	--	--	--	--	.49	.15	2	.08
Dissosteira carolina	--	--	--	--	.40	--	--	1	.04
Dichromorpha viridis	--	--	--	--	.40	--	--	1	.04
Encoptolophus s. sordidus(Burm.)	--	--	--	.10	.81	.73	.30	8	.31
Hadrotettix trifasciatus	--	--	--	--	--	.24	--	1	.04
Hesperotettix speciosus	--	--	--	--	--	.24	--	1	.04
H. viridis pratensis	--	--	--	--	--	--	.15	1	.04
Hippiscus rugosus	--	--	0.82	--	--	.24	--	2	.08
Melanoplus bivittatus	18.03	--	--	7.44	4.03	4.15	9.59	178	6.91
M. differentialis	22.95	--	--	3.13	9.27	7.07	15.74	203	7.88
M. femur-rubrum	18.03	72.92	39.34	26.74	32.66	39.51	36.73	855	33.18
M. keeleri luridus	--	--	--	--	--	.24	--	1	.04
M. mexicanus	21.31	14.58	54.92	20.76	16.53	23.66	10.49	507	19.67
M. packardii	1.64	--	--	.29	--	.97	--	8	.31
Mermiria maculipennis macclungi-	--	--	--	--	--	.24	--	1	.04
Orphulella speciosa	--	--	--	.10	--	.49	--	3	.12
Phoetaliotes nebrascensis	--	--	--	--	--	.24	--	1	.04
Schistocerca a. americana	--	--	1.64	--	--	.49	.60	8	.31
Schistocerca speciosa	--	--	--	--	--	.97	.30	6	.23
Syrbula admirabilis Uhler	--	--	--	.10	--	.24	.15	3	.12
Tettigoniidae sp.	--	--	--	2.06	--	--	4.80	53	2.06
Nymphs	18.03	12.50	3.28	36.53	31.45	14.88	17.84	652	25.30
Total specimens per environment	61	48	122	1,021	248	410	667	2,577	--

IOWA

The percentages of individuals of the various species present in Iowa, arranged according to crops infested, are summarized as follows:

Corn and sorghum	Percent
1. Melanoplus differentialis	23
2. M. mexicanus	21
3. M. bivittatus	18
4. M. femur-rubrum	18
5. M. packardii	2
6. Nymphs	18

Soybeans	Percent
1. Melanoplus femur-rubrum	73
2. M. mexicanus	15
3. Nymphs	12

Red clover	
1. Melanoplus mexicanus	55
2. M. femur-rubrum	39
3. Schistocerca a. americana	2
4. Hippiscus rugosus	1
5. Nymphs	3

Alfalfa and sweetclover	
1. Melanoplus femur-rubrum	27
2. M. mexicanus	21
3. M. bivittatus	7
4. M. differentialis	3
5. Ageneotettix deorum	3
6. 5 other species and nymphs	39

Small grain	
1. Melanoplus femur-rubrum	33
2. M. mexicanus	16
3. M. differentialis	9
4. Ageneotettix deorum	4
5. M. bivittatus	4
6. 3 other species and nymphs	34

Weedy pasture	
1. Melanoplus femur-rubrum	39
2. M. mexicanus	24
3. M. differentialis	7
4. Ageneotettix deorum	4
5. M. bivittatus	4
6. 14 other species and nymphs	22

Field margins	
1. Melanoplus femur-rubrum	37
2. M. differentialis	16
3. M. mexicanus	10
4. M. bivittatus	10
5. Tettigoniidae sp.	5
6. 9 other species and nymphs	22

Grand total	
1. Melanoplus femur-rubrum	33
2. M. mexicanus	20
3. M. differentialis	8
4. M. bivittatus	7
5. Ageneotettix deorum	3
6. 19 other species and nymphs	29

KANSAS

This is the third year in which collections have been made in Kansas during the adult survey. In 6 different environments 3,196 specimens were collected, 29 species being represented. Melanoplus mexicanus was the dominant species in 3 of the 6 environments and was first in numbers in the collection for the State as a whole. Aeoloplus turnbullii bruneri was the second in numbers for the State, being dominant in pastures and margins. M. differentialis was the third in numbers, being the dominant species in corn and sorghums. The main difference between the 1938 and 1939 collections has been the increase in relative abundance of Aeoloplus turnbullii bruneri.

The State is roughly divided into three areas east and west, according to grasshopper conditions. There are no infestations in the eastern third of the State. In the middle third, they are light and spotted. The western third is the area of threatening to severe infestations, where control campaigns are most likely to be necessary.

KANSAS

Distribution by species of 3,196 specimens collected in Kansas, expressed in percentage of total number collected in each habitat

Species	Alfalfa	Pasture	Small grain	Roadside and margin	Sorghum and corn	Idle land	Total specimens	Percentage of grand total
							Number	
Acrolophitus hirtipes Say	--	--	--	0.40	--	--	3	0.09
Aeoloplus turnbullii bruneri	8.67	30.60	31.64	19.17	0.27	13.91	661	20.68
Ageneotettix deorum	--	.73	--	--	.27	--	5	.16
Aulocara elliotti	--	.18	.37	.13	--	--	5	.16
Boopedon nubilum	--	2.00	--	--	--	--	11	.34
Brachystola magna	--	1.82	.12	.27	--	--	13	.41
Derotmema haydenii	--	.18	--	--	--	--	1	.03
Dissosteira longipennis	--	2.00	4.59	.66	4.93	--	71	2.22
Hadrotettix trifasciatus	--	.91	--	.13	.27	--	7	.22
Hesperotettix speciosus	--	7.10	.12	8.79	--	1.91	117	3.66
Melanoplus angustipennis Dodge	--	--	.12	--	--	--	1	.03
M. bivittatus	2.00	8.20	3.72	5.06	17.80	2.78	197	6.16
M. bowditchi bowditchi	--	--	.12	--	.27	--	2	.06
M. differentialis	12.67	6.37	4.22	13.58	54.25	4.52	414	12.95
M. discolor Scudd.	--	--	.12	--	--	--	1	.03
M. femur-rubrum	.67	--	.12	.53	--	--	6	.19
M. foedus foedus	2.00	1.09	.87	.80	1.37	4.35	52	1.63
M. lakinus	--	2.91	2.48	5.99	3.29	5.39	124	3.88
M. mexicanus	34.67	16.03	36.72	18.51	10.96	36.00	822	25.72
M. packardii	8.00	10.38	8.06	7.06	3.29	7.83	244	7.63
Mermiria maculipennis Rehn	--	2.18	.12	--	--	--	13	.41
Mermiria neomexicana Thos.	--	.18	--	--	--	--	1	.03
Opeia obscura	--	.18	--	--	--	--	1	.03
Pardalophora haldemanii Scudd.	--	2.73	--	--	--	--	15	.47
Phoetaliotes nebrascensis	1.33	2.18	--	--	--	--	14	.44
Schistocerca lineata	--	--	--	--	--	.17	1	.03
Spharagemon collare	--	--	--	--	.27	--	1	.03
Spharagemon equale	--	.36	--	--	--	--	2	.06
Trimerotropis laticincta	--	.18	.12	--	.27	.17	4	.12
Undetermined	--	--	.12	.27	--	--	3	.09
Nymphs	30.00	1.46	6.20	18.64	2.46	22.96	384	12.01
Total specimens per environment	150	549	806	751	365	575	3,196	--

KANSAS

The percentages of individuals of the various species present in Kansas, arranged according to crops infested, are summarized as follows:

Alfalfa	Percent
1. Melanoplus mexicanus	35
2. M. differentialis	13
3. Aeoloplus turn. bruneri	9
4. M. packardii	8
5. M. bivittatus	2
6. M. foedus foedus	2
7. 2 other species and nymphs	31

Pasture	Percent
1. Aeoloplus turnbullii bruneri	31
2. Melanoplus mexicanus	16
3. M. packardii	10
4. M. bivittatus	8
5. Hesperotettix speciosus	7
6. 17 other species and nymphs	28

Small grain	Percent
1. Melanoplus mexicanus	37
2. Aeoloplus turn. bruneri	32
3. M. packardii	8
4. Dissosteira longipennis	5
5. M. differentialis	4
6. 12 other species, undeter. and nymphs	14

Roadside and margin	Percent
1. Aeoloplus turn. bruneri	19
2. M. mexicanus	18
3. M. differentialis	14
4. Hesperotettix speciosus	9
5. M. packardii	7
6. 9 other species, undetermined, and nymphs	33

Sorghum and corn	Percent
1. Melanoplus differentialis	54
2. M. bivittatus	18
3. M. mexicanus	11
4. Dissosteira longipennis	5
5. M. lakinus	3
6. M. packardii	3
7. 7 other species and nymphs	6

Idle land	Percent
1. Melanoplus mexicanus	36
2. Aeoloplus turn. bruneri	14
3. M. packardii	8
4. M. lakinus	5
5. M. differentialis	4
6. M. foedus foedus	4
7. 4 other species and nymphs	29

Grand total	Percent
1. Melanoplus mexicanus	26
2. Aeoloplus turnbullii bruneri	21
3. M. differentialis	13
4. M. packardii	8
5. M. bivittatus	6
6. 24 other species, undetermined, and nymphs	26

MICHIGAN

This is the fith year that collections have been made in typical environments in Michigan during the adult survey. There were 17,876 specimens collected in 10 habitats and 19 species of Acrididae were included in the collections. The family Tettigoniidae is grouped as a whole. Melanoplus mexicanus was by far the dominant species in all the environments. M. femur-rubrum was second in numbers and Ageneotettix deorum third. Camnula pellucida, once an important species, was fourth in abundance. There was some change in the relative abundance of the species from 1938 to 1939. M. femur-rubrum increased in relative abundance and C. pellucida greatly decreased. M. mexicanus was not as dominant in 1939 as in 1938.

The worst infestations are to be found in the northern half of the Southern Peninsula, where light to severe infestations occur. In the Upper Peninsula, threatening to severe infestations are few and widely scattered.

Distribution by species of 17,876 specimens collected in Michigan, expressed in percentage of total number collected in each habitat

Species	Pasture	Depleted pasture	Roadside	Legumes	Small grain	Idle land	Native hay	Tame hay	Woods and stream	Misc. row crops	Total specimens	Percentage of grand total
											Number	
Ageneotettox deorum	8.54	19.11	11.74	4.65	2.43	5.49	3.49	1.82	7.98	4.04	1418	7.93
Arphia pseudonietana Thos.	1.79	1.28	1.81	.49	.44	4.10	1.30	.61	2.42	--	284	1.59
Camnula pellucida	4.52	.83	2.18	2.22	1.55	3.74	3.58	3.18	1.93	6.06	544	3.04
Chortippus longicornis	.43	--	1.35	1.25	.77	.07	1.70	1.51	1.33	--	156	.87
Circotettix verruculatus Kby.	.02	--	--	--	--	--	--	--	--	--	1	.01
Dissosteira carolina	--	--	.71	.16	--	.15	.04	--	--	--	26	.15
Encoptolophus s. sordidus (Burm.)	1.14	.83	.87	.73	--	.22	.09	.76	.24	--	124	.69
Hesperotettix viridis pratensis	--	--	.04	--	--	--	--	--	--	--	1	.01
Melanoplus angustipennis (Dodge)	.18	1.09	.19	.20	1.88	--	.04	--	--	1.01	55	.31
M. bivittatus	.16	.26	.19	.28	.22	.29	.18	.30	.36	--	39	.22
M. dawsoni	.16	--	.08	.08	--	.07	.36	.15	.24	--	24	.13
M. femur-rubrum	11.74	2.11	12.64	24.25	34.73	9.60	18.17	30.71	35.43	1.01	2915	16.29
M. flavidus	.08	.06	--	--	.22	.29	.04	--	--	2.02	14	.08
M. keeleri luridus	.02	.06	.04	--	--	--	--	--	--	--	3	.02
M. mexicanus	63.70	68.92	61.37	54.93	49.11	69.08	63.78	45.69	33.37	74.75	10775	60.23
Orphulella speciosa	.90	.26	.87	.57	--	.66	.13	.30	1.09	--	110	.61
Pseudopomala brachyptera Scudd.	--	--	.11	.24	.11	--	--	.60	--	--	14	.08
Schistocerca alutacea	.08	.51	.08	--	--	--	--	--	--	--	14	.08
Spharagemon bolli Scudd.	--	--	--	--	--	--	--	--	.24	--	2	.01
Spharagemon collare	1.37	2.69	.49	.81	.44	1.54	.76	.30	.36	6.06	198	1.11
Nymphs	3.79	1.98	3.42	7.28	5.31	3.59	4.52	6.05	7.01	2.02	793	4.43
Tettigoniidae	1.34	.06	1.77	1.82	2.77	1.10	1.79	8.02	7.86	2.02	361	2.01
Undetermined	.02	--	.04	.04	--	--	--	--	.12	1.01	5	.03
Total specimens per environment	5,090	1,565	2,657	2,474	904	1,365	2,234	661	827	99	17,876	--

MICHIGAN

The percentages of individuals of the various species present in Michigan, arranged according to habitats, are summarized as follows:

Pasture	Percent
1. Melanoplus mexicanus	64
2. Melanoplus femur-rubrum	12
3. Ageneotettix deorum	9
4. Camnula pellucida	5
5. Arphia pseudonietana	2
6. 12 other species	4
7. Nymphs	4

Depleted pasture	Percent
1. Melanoplus mexicanus	69
2. Ageneotettix deorum	19
3. Spharagemon collare	3
4. Melanoplus femur-rubrum	2
5. Arphia pseudonietana	1
6. 8 other species	4
7. Nymphs	2

Roadside	
1. Melanoplus mexicanus	61
2. Melanoplus femur-rubrum	13
3. Ageneotettix deorum	12
4. Camnula pellucida	2
5. Arphia pseudonietana	2
6. 13 other species	7
7. Nymphs	3

Legumes	
1. Melanoplus mexicanus	55
2. Melanoplus femur-rubrum	24
3. Ageneotettix deorum	5
4. Camnula pellucida	2
5. Tettigoniidae	2
6. 9 other species	5
7. Nymphs	7

Small grain	
1. Melanoplus mexicanus	49
2. Melanoplus femur-rubrum	35
3. Tettigoniidae	3
4. Ageneotettix deorum	2
5. Melanoplus angustipennis	2
6. 7 other species	4
7. Nymphs	5

Idle land	
1. Melanoplus mexicanus	69
2. Melanoplus femur-rubrum	10
3. Ageneotettix deorum	5
4. Arphia pseudonietana	4
5. Camnula pellucida	4
6. 9 other species	4
7. Nymphs	4

Native hay	
1. Melanoplus mexicanus	64
2. Melanoplus femur-rubrum	18
3. Camnula pellucida	4
4. Ageneotettix deorum	3
5. Tettigoniidae	2
6. 10 other species	4
7. Nymphs	5

Tame hay	
1. Melanoplus mexicanus	46
2. Melanoplus femur-rubrum	31
3. Tettigoniidae	8
4. Camnula pellucida	3
5. Ageneotettix deorum	2
6. 8 other species	4
7. Nymphs	6

Woods and stream	
1. Melanoplus femur-rubrum	35
2. Melanoplus mexicanus	33
3. Ageneotettix deorum	8
4. Tettigoniidae	8
5. Arphia pseudonietana	2
6. 8 other species	7
7. Nymphs	7

Row Crops	
1. Melanoplus mexicanus	75
2. Camnula pellucida	6
3. Spharagemon collare	6
4. Ageneotettix deorum	4
5. Melanoplus flavidus	2
6. 4 other species	5
7. Nymphs	2

MICHIGAN (Continued)

Grand total	Percent
1. Melanoplus mexicanus----------	60
2. Melanoplus femur-rubrum--------	16
3. Ageneotettix deorum----------	8
4. Camnula pellucida----------	3
5. Tettigoniidae----------	2
6. 16 other species----------	7
7. Nymphs----------	4

MINNESOTA

This is the fifth year that collections have been made in Minnesota. During the season of 1939 there was some misunderstanding regarding the making of collections during the adult survey. Therefore, there are no collections from the southwest quarter, where Melanoplus differentialis was the dominant species. All of the collections for the eight designated environments are from the northwestern part of the State. The eastern part of the State is represented by a combined crop-and-pasture classification.

There were 9,185 specimens in the collections, representing 22 species. In the northwestern part of the State Melanoplus bivittatus was dominant in sweetclover, alfalfa, corn, and flax. Camnula pellucida was dominant in the bluegrass, quackgrass, and short-grass pastures. M. mexicanus was the most numerous in collections from small grain, potatoes, and field margins. In the eastern part of the State M. femur-rubrum was by far the dominant species in all environments. M. mexicanus and M. bivittatus have increased in relative abundance over 1938.

The situation in Minnesota in the 1939 survey resolved itself into three rather distinct problems. The most severe infestations were in the western two or three tiers of counties, extending north and south throughout the length of the State. This area was divided into two parts, owing to the differences in the important species. In the counties north of Wilkin County the dominant species was M. mexicanus. M. bivittatus was of first importance and Camnula pellucida of second importance. South of Wilkin County, in the southwestern part of the State, M. differentialis was the dominant species, with infestations along field margins and egg pods averaging 58 per square foot along some of the field edges. The third area of infestation lies in the east-central part where M. femur-rubrum was dominant, almost to the exclusion of the other species just mentioned.

MINNESOTA

Distribution by species of 9,185 specimens collected in Minnesota, expressed in percentage of total number collected in each habitat

Species	Sweet-clover-alfalfa	Corn	Flax	Blue-grass quack-grass	Short-grass pasture	Pota-toes	Field margins	Eastern crop and pasture	Small grain	Total Speci-mens	Percent-age of grand total
										Number	
Aeropedellus clavatus	--	1.96	--	1.96	--	--	--	--	0.13	18	0.20
Ageneotettix deorum	--	--	0.43	.65	1.37	--	0.60	--	.27	26	.28
Arphia pseudonietana	--	--	--	--	--	--	1.80	.07	--	14	.15
Camnula pellucida	1.74	1.96	2.55	22.51	35.24	1.71	8.71	.36	34.36	1080	11.75
Chortippus longicornis	.41	5.88	.43	4.73	3.20	--	14.71	.50	.27	195	2.12
Dissosteira carolina	.10	.98	.21	.33	.23	.86	.30	.07	.13	16	.17
Encopt. serdidus costalis	.20	.98	.43	10.76	17.84	--	3.30	.03	1.20	271	2.95
Melanoplus angustipennis	.92	--	1.28	1.14	1.14	--	1.20	--	.27	53	.58
M. bivittatus	31.99	31.38	35.32	18.76	7.55	25.64	15.63	2.04	9.36	1366	14.86
M. confusus	--	--	1.70	.82	.69	--	.60	--	.80	35	.38
M. dawsoni	7.69	6.86	2.13	13.38	14.65	2.56	14.41	1.97	2.14	570	6.20
M. differentialis	--	--	--	--	--	--	--	2.25	--	63	.69
M. femur-rubrum	22.35	16.67	16.60	4.08	4.12	20.51	9.31	84.96	9.36	3209	34.91
M. gladstoni	.61	--	.85	.65	.46	2.56	1.20	.43	.80	59	.64
M. infantilis	.15	--	.85	1.63	--	1.71	3.00	--	.67	49	.53
M. mexicanus	29.93	26.47	34.03	13.86	11.44	41.03	23.43	1.50	38.77	1809	19.68
M. keeleri luridus	--	--	--	--	--	--	--	.29	--	8	.09
M. packardii	3.69	5.88	2.55	1.47	.69	2.56	--	--	1.07	130	1.41
Orphulella pelidna	--	--	.43	1.31	--	--	--	.03	--	11	.12
Orphulella speciosa	--	--	--	--	--	--	--	.11	--	3	.03
Phoetaliotes nebrascensis	--	.98	--	1.63	.92	--	1.20	.50	.13	44	.48
Spharagemon collare	.20	--	.21	.33	.46	.86	.60	--	.27	20	.22
Nymphs	--	--	--	--	.--	--	--	4.87	--	136	1.48
Total specimens per environment	1,951	204	470	613	874	117	666	2,794	1,496	9,185	--

MINNESOTA

The percentages of individuals of the various species present in Minnesota, arranged according to crops infested, are summarized as follows:

Sweetclover and alfalfa	Percent
1. Melanoplus bivittatus	32
2. Melanoplus mexicanus	30
3. Melanoplus femur-rubrum	22
4. Melanoplus dawsoni	8
5. Melanoplus packardii	4
6. 8 other species	4

Corn	Percen
1. Melanoplus bivittatus	31
2. Melanoplus mexicanus	26
3. Melanoplus femur-rubrum	17
4. Melanoplus dawsoni	7
5. Chortippus longicornis	6
6. Melanoplus packardii	6
7. 5 other species	7

Flax	
1. Melanoplus bivittatus	35
2. Melanoplus mexicanus	34
3. Melanoplus femur-rubrum	17
4. Camnula pellucida	3
5. Melanoplus packardii	3
6. 11 other species	8

Bluegrass and quackgrass	
1. Camnula pellucida	23
2. Melanoplus bivittatus	19
3. Melanoplus mexicanus	14
4. Melanoplus dawsoni	13
5. Encoptolophus sordidus costalis	11
6. 13 other species	20

Shortgrass pasture	
1. Camnula pellucida	35
2. Encoptolophus sordidus costalis	18
3. Melanoplus dawsoni	15
4. Melanoplus mexicanus	11
5. Melanoplus bivittatus	8
6. 10 other species	13

Potatoes	
1. Melanoplus mexicanus	41
2. Melanoplus bivittatus	26
3. Melanoplus femur-rubrum	20
4. Melanoplus dawsoni	3
5. Melanoplus gladstoni	3
6. Melanoplus packardii	3
7. 4 other species	4

Field margins	
1. Melanoplus mexicanus	23
2. Melanoplus bivittatus	16
3. Chortippus longicornis	15
4. Melanoplus dawsoni	14
5. Melanoplus femur-rubrum	9
6. 11 other species	23

Eastern crop and pasture	
1. Melanoplus femur-rubrum	85
2. Melanoplus differentialis	2
3. Melanoplus bivittatus	2
4. Melanoplus dawsoni	2
5. Melanoplus mexicanus	1
6. 11 other species	3
7. Nymphs	5

Small grain	
1. Melanoplus mexicanus	39
2. Camnula pellucida	34
3. Melanoplus bivittatus	9
4. Melanoplus femur-rubrum	9
5. Melanoplus dawsoni	2
6. 12 other species	7

Grand total	
1. Melanoplus femur-rubrum	35
2. Melanoplus mexicanus	20
3. Melanoplus bivittatus	15
4. Camnula pellucida	12
5. Melanoplus dawsoni	6
6. 17 other species	12

MISSOURI

This is the second year in which Missouri has been included in the making of collections in typical habitats. Grasshopper populations are at a low ebb and it was difficult to obtain a good representative number of specimens. There were 444 specimens collected in 5 different environments. In these collections 14 species were represented. Melanoplus differentialis was the dominant species in the total number of specimens collected in the State. In the small number collected in small grain M. mexicanus was most numerous. There were too few specimens in any environment to permit definite conclusions.

MISSOURI

Distribution by species of 444 specimens collected in Missouri, expressed in percentage of total number collected in each habitat

Species	Pasture	Field margin	Corn	Legumes	Small grain	Total specimens	Percentage of grand total
						Number	
Ageneotettix deorum	3.45	--	--	1.10	---	4	0.90
Chortophaga viridifasciata	--	--	--	--	2.27	1	.22
Chloealtis conspersa Harr.	--	--	--	.55	--	1	.22
Dichromorpha viridis Scudd.	--	--	--	.55	--	1	.22
Hesperotettix speciosus	3.45	--	1.60	.55	--	5	1.13
Hesperotettix viridis pratensis	--	2.78	--	--	--	1	.22
Hippiscus rugosus	6.90	--	--	3.87	--	11	2.48
Melanoplus bivittatus	1.72	8.33	4.00	3.31	--	15	3.38
M. differentialis	70.69	77.78	82.40	49.72	22.73	272	61.26
M. femur-rubrum	10.34	2.78	4.00	13.81	11.36	42	9.46
M. mexicanus	--	--	1.60	6.08	25.00	24	5.40
M. s. scudderi (Uhler)	1.72	--	--	1.66	--	4	.90
Schistocerca a. americana	--	--	3.20	2.76	6.82	12	2.70
Syrbula admirabilis	--	--	--	.55	--	1	.22
Undetermined	--	8.33	--	.55	--	4	.90
Nymphs	1.72	--	3.20	14.92	31.82	46	10.36
Total specimens per environment	58	36	125	181	44	444	--

MISSOURI

The percentages of individuals of the various species present in Missouri, arranged according to crops infested, are summarized as follows:

Pasture	Percent
1. Melanoplus differentialis--	71
2. M. femur-rubrum----------	10
3. Hippiscus rugosus----------	7
4. Agenéotettix deorum---------	3
5. Hesperotettix speciosus----	3
6. 2 other species and nymphs	6

Field margin	Percent
1. Melanoplus differentialis--	78
2. M.bivittatus----------	8
3. Undetermined----------	8
4. Hesperotettix vir. pratensis	3
5. M.femur-rubrum----------	3

Corn	
1. Melanoplus differentialis--	82
2. M. bivittatus----------	4
3. M. femur-rubrum----------	4
4. Schistocerca a. americana--	3
5. 2 other species and nymphs-	7

Legumes	
1. Melanoplus differentialis--	50
2. M. femur-rubrum----------	14
3. M. mexicanus----------	6
4. Hippiscus rugosus----------	4
5. M. bivittatus----------	3
6. Schistocerca a. americana--	3
7. 7 other species and nymphs-	20

Small grain	
1. Melanoplus mexicanus-------	25
2. M. differentialis----------	23
3. M. femur-rubrum----------	11
4. Schistocerca a. americana--	7
5. Chortophaga viridifasciata-	2
6. Nymphs----------	32

Grand total	
1. Melanoplus differentialis--	61
2. M.femur-rubrum----------	9
3. M. mexicanus----------	5
4. M. bivittatus----------	3
5. Schistocerca a. americana--	3
6. 10 other species and nymphs	19

MONTANA

This is the sixth year in which collections have been made in Montana during the adult survey. There were 10,542 specimens representing 59 species collected in 11 different major environments. Melanoplus mexicanus was the dominant species in 10 out of the 11 habitats and formed 46 percent of the total number of specimens collected. Ageneotettix deorum was second in total numbers collected and first in numbers on the range land. Outside of the open range, no other species compared with M. mexicanus in importance. In 1938 M. mexicanus formed 54 percent of the total specimens collected in the range land, but in 1939 it made up only 17 percent of the total. The comparative percentages in the following table show the decrease in relative abundance of this species from 1938 to 1939.

Table 12--M. mexicanus, percentage of total number of specimens collected in the major habitats

Habitat	Percentage of total collected	
	1938	1939
Small grain----------	82	73
Idle land----------	83	67
Roadside----------	62	54
Range land----------	54	17
Alfalfa----------	46	59
Total for State----------	63	46

These data indicate a falling off of the relative abundance of M. mexicanus for the State as a whole, although it is a serious problem in 7 north-central counties. At least 90 percent of the severe infestations are in small-grain stubble and idle land. In Hill County there was an average of 7.09 pods per square foot recorded in 915 field samples taken in 109 fields. This is the heaviest infestation on record since the present annual grasshopper surveys were established in 1931. The infestations in the 7 north-central counties result from flights of M. mexicanus originating in the eastern part of the State in July and August.

Distribution by species of 10,542 specimens collected in Montana, expressed in percentage of total number collected in each habitat

Species	Roadside	Range	Idle land	Small grain	Low mt. range	Alfalfa sweet clover	Misc. row crops	Crested wheat grass	Flax	Weedy pasture	Bottom land	Total specimens	Percentage of grand total
												Number	
Acrolophitus hirtipes	--	0.03	--	--	--	--	--	--	--	--	--	1	
Aeoloplus t. turnbullii Thos.	1.14	.38	0.57	0.81	--	0.32	0.32	--	--	3.24	--	65	0.62
Aerochoreutes carlinianus Thos.	.15	.06	.07	--	--	--	--	--	--	.54	--	7	.07
Aeropedellus clavatus	--	.06	--	--	--	--	--	--	--	--	--	2	.02
Ageneotettix deorum	1.93	17.98	.79	.47	10.69	.21	--	3.54	--	5.94	1.86	723	6.86
Amphitornus coloradus	.69	3.26	.43	--	3.21	--	--	.88	--	4.32	.53	150	1.42
Arphia p. pseudonietana	.54	.55	--	.07	1.60	.11	--	--	--	.54	1.06	40	.38
Aulocara elliotti	.36	6.02	.72	.27	1.60	.11	--	--	--	4.86	.80	244	2.31
Brachystola magna	--	.03	--	--	.53	--	--	--	--	--	--	2	.02
Bruneria brunnea Thos.	--	.35	.07	--	12.83	.11	--	--	--	--	--	38	.36
Camnula pellucida	1.09	.96	--	.27	1.07	1.16	--	--	--	4.32	.80	83	.79
Chortippus longicornis	.05	.03	--	--	.53	--	--	--	--	--	.53	5	.05
Circotettix rabula R.& H.	--	--	--	--	--	--	--	--	--	--	.26	1	.01
Circotettix undulatus Rhen.	--	--	--	--	3.21	--	--	--	--	--	--	6	.06
Cordillacris crenulata	.05	.96	--	--	--	--	--	--	--	1.08	--	36	.34
Cordillacris occipitalis cinerea	--	.06	--	--	--	--	--	--	--	--	--	2	.02
Cratypedes neglectus Thos.	--	--	--	--	1.07	--	--	--	--	--	--	2	.02
Derotmema haydenii	.30	.17	.43	.20	.53	--	--	.44	--	.54	1.33	29	.27
Dissosteira carolina	1.78	.41	1.01	2.36	--	.95	--	.44	2.37	1.62	.08	120	1.14
Drepanopterna femoratum	.49	5.24	.36	--	--	--	--	.44	--	.54	.53	199	1.89
Encoptolophus sordidus costalis	.15	.81	.07	.13	2.14	--	--	--	1.42	1.08	2.66	53	.50
Hadrotettix trifasciatus	.05	.38	.36	.07	1.60	--	--	--	--	--	.26	24	.23
Hesperotettix viridis pratensis	.10	.23	.14	.13	--	--	--	--	--	1.62	--	17	.16
Hippiscus rugosus	--	.09	--	--	1.07	--	--	--	--	--	--	5	.05
Hypochlora alba	.15	1.16	--	--	.53	--	--	--	--	--	--	44	.42
Melanoplus alpinus Scudd.	--	--	--	.40	--	--	--	--	--	--	--	6	.06
M. angustipennis	1.04	.23	1.51	2.49	1.07	--	--	--	--	--	--	89	.84
M. bivittatus	2.23	.15	.29	1.41	.53	2.64	--	--	--	1.62	1.33	109	1.03
M. borealis Fieb.	--	--	--	.07	--	--	--	--	--	--	--	1	.01
M. bowditchi canus Hebard	.10	.64	--	.07	--	--	--	--	--	--	.26	26	.25

MONTANA (Continued)

Species	Roadside	Range	Idle land	Small grain	Low mt. range	Alfalfa sweet clover	Misc. row crops	Crested wheat grass	Flax	Weedy pasture	Bottom land	Total specimens	Percentage of grand total
												Number	
M. bruneri	--	--	--	0.13	--	--	--	--	--	--	--	2	0.02
M. dawsoni	--	0.41	--	--	1.60	--	--	--	--	--	0.26	18	.17
M. differentialis	0.99	--	--	.20	--	--	--	--	--	--	--	23	.22
M. femur-rubrum	3.47	.49	4.38	1.88	.53	14.80	5.33	0.88	4.26	2.70	25.80	434	4.12
M. gladstoni	5.90	4.01	4.16	2.22	1.60	1.69	--	7.96	4.74	3.78	--	403	3.82
M. infantilis	2.13	6.14	1.08	1.28	5.35	1.06	2.67	9.27	3.32	.54	.80	342	3.24
M. lakinus	--	--	--	--	--	5.92	--	--	--	--	--	56	.53
M. mexicanus	53.69	16.70	66.62	73.53	26.74	59.41	80.00	47.79	75.35	32.97	40.69	4,826	45.78
M. occidentalis	--	.26	.22	.27	1.60	--	--	--	--	--	--	19	.18
M. oregonensis Thos.	--	--	--	.13	--	--	--	--	--	--	--	2	.02
M. packardii	6.64	1.50	9.11	6.94	6.42	4.55	10.67	7.96	4.26	2.70	1.06	526	4.99
Mermiria maculipennis macclungi	--	.30	--	--	--	--	--	--	--	--	--	10	.09
Mestobregma p. plattei Thos.	--	1.15	--	--	--	--	--	--	--	--	--	5	.05
Metator pardalinus Sauss.	.54	3.58	.36	.13	.53	.11	--	.88	--	9.73	1.86	170	1.61
Opeia obscura Thos.	.20	1.34	--	--	.53	--	--	--	--	3.78	6.12	81	.77
Orphulella speciosa	--	.06	--	--	--	--	--	--	--	--	1.86	9	.08
Phlibostroma quadrimaculatum	.64	9.69	.14	--	2.14	--	--	--	--	4.32	.53	362	3.43
Phoetaliotes nebrascensis	.54	1.95	.14	.27	1.60	.11	--	--	.47	.54	4.25	106	1.01
Pseudopomala brachyptera	--	.03	--	--	--	--	--	--	--	--	--	1	.01
Schistocerca lineata	--	.06	--	--	.53	--	--	--	--	.54	.53	6	.06
Spharagemon collare	.44	--	.36	.13	--	.74	--	.44	.47	--	--	25	.24
Spharagemon equale	2.77	2.07	2.72	.87	--	.74	1.33	3.10	2.37	.54	.80	202	1.92
Trachyrhachis k. kiowa	1.90	5.90	.29	--	1.60	.11	--	.44	.47	3.78	1.59	265	2.51
Trimerotropis campestris	.10	.03	--	--	1.60	--	--	--	--	--	--	6	.06
Trimerotropis laticincta	.54	.12	.22	.07	--	.53	--	--	.47	--	--	25	.24
T. gracilis sordida Walk.	.20	.03	--	--	1.60	--	--	--	--	--	--	8	.07
T. pistrinaria Sauss.	--	.26	--	--	1.07	--	--	--	--	--	--	11	.10
T. suffussus Scudd.	--	--	--	--	1.07	--	--	--	--	--	--	2	.01
T. pallidipennis	--	--	.14	--	--	--	--	--	--	--	.80	5	.05
Nymphs	6.83	4.39	3.66	2.69	--	4.65	--	15.49	--	2.16	--	463	4.39
Total specimens per environment	2,019	3,438	1,394	1,485	187	946	75	226	211	185	376	10,542	--

MONTANA

The percentages of individuals of the various species present in Montana, arranged according to crops infested, are summarized as follows:

Roadside	Percent
1. Melanoplus mexicanus-------	54
2. M. packardii---------------	7
3. M. gladstoni---------------	6
4. M. femur-rubrum------------	3
5. Spharagemon equale---------	3
6. 30 other species and nymphs	27

Range	Percent
1. Ageneotettix deorum--------	18
2. M. mexicanus---------------	17
3. Phlibostroma quadrimaculatum	10
4. M. infantilis--------------	6
5. Aulocara elliotti----------	6
6. Trachyrhachis k. kiowa-----	6
7. 41 other species and nymphs	37

Idle land	
1. Melanoplus mexicanus-------	67
2. M. packardii---------------	9
3. M. femur-rubrum------------	4
4. M. gladstoni---------------	4
5. Spharagemon equale---------	3
6. 23 other species and nymphs	13

Small grain	
1. Melanoplus mexicanus-------	73
2. M. packardii---------------	7
3. M. a. angustipennis--------	2
4. Dissosteira carolina-------	2
5. M. gladstoni---------------	2
6. 24 other species and nymphs	14

Low mountain range	
1. Melanoplus mexicanus-------	27
2. Bruneria brunnea-----------	13
3. Ageneotettix deorum--------	11
4. M. packardii---------------	6
5. M. infantilis--------------	5
6. 29 other species-----------	38

Alfalfa and sweetclover	
1. Melanoplus mexicanus-------	59
2. M. femur-rubrum------------	15
3. M. lakinus-----------------	6
4. M. packardii---------------	4
5. M. bivittatus--------------	3
6. 15 other species and nymphs	13

Misc. row crops	
1. Melanoplus mexicanus-------	80
2. M. packardii---------------	11
3. M. femur-rubrum------------	5
4. M. infantilis--------------	3
5. Spharagemon equale---------	1

Crested wheatgrass	
1. Melanoplus mexicanus-------	48
2. M. infantilis--------------	9
3. M. gladstoni---------------	8
4. M. packardii---------------	8
5. Ageneotettix deorum--------	3
6. Spharagemon equale---------	3
7. 8 other species and nymphs-	21

Flax	
1. Melanoplus mexicanus-------	75
2. M. gladstoni---------------	5
3. M. femur-rubrum------------	4
4. M. packardii---------------	4
5. M. infantilis--------------	3
6. 7 other species------------	9

Weedy pasture	
1. Melanoplus mexicanus-------	33
2. Metator pardalinus---------	10
3. Ageneotettix deorum--------	6
4. Aulocara elliotti----------	5
5. Amphitornus coloradus------	4
6. Camnula pellucida----------	4
7. Phlibostroma quadrimaculatum	4
8. 19 other species and nymphs-	34

MONTANA (Continued)

	Bottom land	Percent
1.	Melanoplus mexicanus	41
2.	M. femur-rubrum	26
3.	Opeia obscura	6
4.	Phoetaliotes nebrascensis	4
5.	Encoptolophus sordidus costalis	3
6.	23 other species	20

	Grand total	Percent
1.	Melanoplus mexicanus	46
2.	Ageneotettix deorum	7
3.	M. packardii	5
4.	M. femur-rubrum	4
5.	M. gladstoni	4
6.	54 other species and nymphs	34

NEBRASKA

This is the fourth year in which collections have been made in this State, and 24,363 specimens, including 54 species, were collected in 10 major environments. For the collections as a whole, Melanoplus mexicanus was dominant, with M. differentialis and M. bivittatus of equal importance in second and third places and Melanoplus femur-rubrum fourth. In the upland and sand-hill grasslands, Ageneotettix deorum was the most numerous, whereas in the bottom-land grasses M. femur-rubrum was dominant. This indicates a decided reduction of M. mexicanus on the range land, where it was the dominant species in 1938. In fact, the relative abundance of M. mexicanus has fallen off in all the environments. For instance, in 1938 it was dominant in all of 7 habitats included in the collections, forming from 29 to 46 percent of the total number of specimens collected in these places and 32 percent of the total number collected in the State. In 1939 it was dominant in only 4 out of the 9 habitats included in the collections, forming in these 4 habitats from 20 to 37 percent of the total number collected in these environments and 25 percent of the total number collected in the State. On the other hand, M. differentialis and M. bivittatus have increased in relative abundance but not necessarily in actual numbers. Therefore, there is no doubt that M. mexicanus has decreased in importance in Nebraska.

The largest areas of severe infestation extend diagonally across the eastern third of the State, from the northeast to the southwest. These infestations are made up largely of M. differentialis and M. bivittatus as far west as the western edge of Valley, Sherman, Buffalo, Kearney, and Franklin Counties. They occur in sorghum and corn stubble, field margins, alfalfa, and small-grain stubble. In the south-central and central parts of the State the infestations are lighter and of a mixed population, with M. mexicanus becoming more important to the westward. In the Panhandle area, where M. mexicanus was numerous in 1939, the egg survey showed that infestations had decreased.

Distribution by species of 24,363 specimens collected in Nebraska, expressed in percentage of total number collected in each habitat

Species	Stubble	Sorghum	Corn	Alfalfa	Sugar beets	Roadside	Restoration land	Upland grasses	Bottomland grasses	Sand hill grasses	Total specimens	Percentage of grand total
											Number	
Aeoloplus turnbullii bruneri	5.42	--	0.34	1.42	--	6.90	--	0.81	3.84	--	756	3.10
Aeoloplus t. turnbullii	2.34	1.89	.14	.39	0.89	3.37	2.66	2.59	.46	--	451	1.85
Ageneotettix deorum	2.98	5.90	.14	1.58	--	2.58	.61	25.89	3.72	27.45	1339	5.50
Ampnitornus coloradus	--	--	--	.04	--	--	--	4.88	.58	5.25	172	.70
Arphia p. pseudonietana	.01	--	--	--	--	--	--	.51	--	.08	12	.05
Aulocara elliotti	1.99	3.30	--	.44	.89	.46	.61	8.44	5.59	1.90	450	1.85
Boopedon nubilum	.08	.24	--	--	--	.05	--	1.17	--	--	32	.13
Brachystola magna	--	--	--	--	--	.05	--	--	--	--	2	.008
Camnula pellucida	--	--	--	.02	--	--	--	--	--	--	1	.004
Campylacantha o. olivacea	--	--	--	--	--	--	.04	--	--	--	1	.004
Cordillacris crenulata	--	--	--	--	--	--	.04	.05	.46	--	6	.02
C. occipitalis Thos.	--	--	--	--	--	--	.08	.15	.35	.23	11	.04
Derotmema haydenii	.11	.12	--	.24	--	.32	.08	--	.58	.08	41	.17
Dissosteira carolina	.08	--	--	.02	--	.05	.04	--	--	--	9	.04
Dissosteira longipennis	.05	--	--	--	--	--	--	.30	--	--	9	.04
Drepanopterna femoratum	--	.12	--	--	--	--	--	3.05	5.35	--	107	.44
Encoptolophus sordidus costalis	--	--	--	--	--	--	--	--	.58	--	5	.02
Hadrotettix trifasciatus	.08	.71	--	.02	--	.07	.33	.56	.12	.53	42	.17
Hesperotettix speciosus	.08	.12	.14	.06	--	.16	.57	.05	.12	--	34	.14
H. viridis pratensis	--	--	--	--	--	.14	.08	.05	.23	.73	21	.09
Hippiscus rugosus	.01	--	--	--	--	.05	--	.20	.12	.68	17	.07
Hypochlora alba	.03	--	--	--	--	--	--	.41	--	.68	19	.08
Melanoplus a. angustipennis	6.60	2.01	.27	4.62	1.78	3.81	25.20	5.80	1.75	15.66	1766	7.25
M. bivittatus	10.70	33.65	30.86	18.10	22.25	14.54	4.75	.10	3.14	.15	3081	12.65
M. bowditchi Scudd.	--	--	--	--	--	--	.16	.05	--	2.58	39	.16
M. confusus Scudd.	--	--	--	.02	--	--	--	--	--	--	1	.004
M. differentialis	6.70	19.48	52.06	17.97	38.87	17.73	3.48	.20	.23	.23	3153	12.94
Melanoplus femur-rubrum	13.02	2.71	5.55	9.81	11.87	13.57	1.47	.61	41.09	3.88	2444	10.03

NEBRASKA (Continued)

Species	Stubble	Sorghum	Corn	Alfalfa	Sugar beets	Roadside	Restoration land	Upland grasses	Bottom land grasses	Sand hill grasses	Total specimens	Percentage of grand total
											Number	
Melanoplus f. flavidus Scudd.	1.48	--	--	0.20	0.30	0.14	11.88	0.05	0.35	1.67	425	1.74
M. foedus fluviatilis Brun.	.33	--	1.03	.52	--	.74	--	--	--	--	92	.38
M. foedus foedus	3.14	0.83	.34	1.40	4.15	2.21	9.78	1.47	1.05	2.43	690	2.83
M. gladstoni	.32	--	--	.11	--	.02	.16	.10	.23	.91	46	.19
M. infantilis	--	--	--	--	--	--	.04	--	.35	.08	5	.02
M. lakinus	.16	.12	--	.09	--	.44	--	.05	.12	--	36	.15
M. mexicanus	37.28	18.30	7.27	24.47	18.40	20.00	29.30	22.89	8.38	11.79	6,031	24.75
M. occidentalis	.03	--	--	.09	--	.05	.04	.46	--	.08	19	.08
M. packardii	2.90	1.53	.27	2.03	--	1.25	5.12	1.17	.46	.08	499	2.04
M. regalis Dodge	--	--	--	--	--	--	--	.20	--	.08	5	.02
Mermiria maculipennis	.35	1.77	--	0.17	--	.88	.08	1.27	1.16	3.12	161	.66
Mermiria neomexicana	--	--	--	--	--	.02	--	--	--	--	1	.004
Metator pardalinus	--	--	--	--	--	--	.04	.05	1.63	--	16	.06
Opeia obscura	--	.12	--	--	--	.09	.08	1.37	6.75	1.29	109	.45
Orphulella p. pelidna	.01	--	--	--	--	.05	.33	.20	.46	4.18	74	.30
Pardalophora haldemanii	--	--	--	--	--	--	--	--	.23	--	2	.008
Paropomala wyomingensis	--	--	--	--	--	--	--	--	.12	--	1	.004
Phlibostroma quadrimaculatum	.05	.12	--	--	--	.07	.04	6.97	3.14	6.39	256	1.05
Phoetaliotes nebrascensis	.25	1.30	--	.09	--	.56	.16	4.07	.35	1.37	160	.66
Schistocerca lineata	.01	--	--	--	--	--	.04	.05	--	--	3	.01
Spharagemon collare	.37	.12	--	.09	--	.16	1.72	.46	.58	4.94	156	.64
Spharagemon equale	.11	--	--	.15	--	.07	--	.66	--	--	30	.12
Syrbula admiralis	--	--	--	--	--	--	--	--	.58	--	5	.02
Trachyrhachis k. kiowa	--	--	--	--	--	--	.12	.41	1.05	1.37	38	.15
Trimerotropis laticincta	--	--	--	--	--	--	.04	--	--	--	2	.008
Undetermined	.03	--	--	--	--	.09	.04	.71	--	.08	22	.09
Nymphs	2.84	5.55	1.58	15.78	0.59	9.29	.74	1.47	4.66	--	1,458	5.98
Total specimens per environment	6,269	847	1,458	4,568	337	4,304	2,440	1,966	859	1,315	24,363	--

NEBRASKA

The percentages of individuals of the various species present in Nebraska, arranged according to crops infested, are summarized as follows:

Stubble	Percent
1. Melanoplus mexicanus	37
2. M. femur-rubrum	13
3. M. bivittatus	11
4. M. differentialis	7
5. M. a. angustipennis	7
6. 26 other spp., undet., and nymphs	25

Sorghum	Percent
1. Melanoplus bivittatus	34
2. M. differentialis	19
3. M. mexicanus	18
4. Ageneotettix deorum	6
5. Aulocara elliotti	3
6. 16 other spp., and nymphs	20

Corn	Percent
1. Melanoplus differentialis	52
2. M. bivittatus	31
3. M. mexicanus	7
4. M. femur-rubrum	6
5. M. foedus fluviatilis	1
6. 7 other spp., and nymphs	3

Alfalfa	Percent
1. Melanoplus mexicanus	24
2. M. bivittatus	18
3. M. differentialis	18
4. M. femur-rubrum	10
5. M. a. angustipennis	5
6. 23 other spp., and nymphs	25

Sugar beets	Percent
1. Melanoplus differentialis	39
2. M. bivittatus	22
3. M. mexicanus	18
4. M. femur-rubrum	12
5. M. foedus foedus	4
6. 4 other spp., and nymphs	5

Roadside	Percent
1. Melanoplus mexicanus	20
2. M. differentialis	18
3. M. bivittatus	14
4. M. femur-rubrum	14
5. Aeoloplus turnbullii bruneri	7
6. 27 other spp., undet., nymphs	27

Restoration land	Percent
1. Melanoplus mexicanus	29
2. M. a. angustipennis	25
3. M. f. flavidus	12
4. M. foedus foedus	10
5. M. packardii	5
6. 28 other spp., undet., and nymphs	19

Upland grasses	Percent
1. Ageneotettix deorum	26
2. M. mexicanus	23
3. Aulocara elliotti	8
4. Phlibostroma quadrimaculatum	7
5. M. a. angustipennis	6
6. 34 other spp., undet., and nymphs	30

Bottom-land grasses	Percent
1. Melanoplus femur-rubrum	41
2. M. mexicanus	8
3. Opeia obscura	7
4. Aulocara elliotti	6
5. Drepanopterna femoratum	5
6. 31 other spp., and nymphs	33

Sandhill grasses	Percent
1. Ageneotettix deorum	27
2. M. a. angustipennis	16
3. M. mexicanus	12
4. Spharagemon collare	5
5. Orphulella p. pelidna	4
6. 24 other spp., and undet.,	36

Grand total	Percent
1. Melanoplus mexicanus	25
2. M. differentialis	13
3. M. bivittatus	13
4. M. femur-rubrum	10
5. M. a. angustipennis	7
6. 48 other spp., undet., and nymphs	32

NEVADA

This is the second year that collections were made in Nevada during the adult survey. A total of 5,583 specimens of grasshoppers were collected in 4 typical habitats and 23 species were recorded. In the 1938 collections Melanoplus mexicanus was called M. devastator, and in the 1939 collections, M. mexicanus. This species is the most important in the State, forming 56 percent of the total number of specimens collected; however, in the Smoky Valley areas M. occidentalis was the most important rangeland grasshopper, but none appeared in the collections.

According to Skoog, all of the specimens listed as Melanoplus mexicanus in the 1939 Nevada collections probably belong to the race bilituratus Walk. There is however, some conflicting opinion regarding the correct classification of this Nevada material, and until a definite understanding is reached on what to call it, it will all be called M. mexicanus.

NEVADA

Distribution by species of 5,583 specimens collected in various habitats of Nevada, expressed in percentages of total numbers collected in each habitat

Species	Alfalfa	Range	Wild hay	Small grain	Total specimens	Percentage of grand total
					Number	
Aeoloplus (sp.)	0.03	0.16	--	--	3	0.05
Agenecottetix deorum	--	.08	--	--	1	.02
Amphitornus (sp.)	--	.08	0.20	--	2	.03
Arphia pseudonietana	.22	2.00	--	--	33	.59
Aulocara elliotti	.47	2.72	--	--	51	.91
Camnula pellucida	.72	.24	54.66	--	298	5.33
Chortippus longicornis	.05	--	--	--	2	.03
Conozoa wallula Scudd.	3.81	28.19	1.42	--	496	8.88
Dissosteira carolina	--	.08	--	--	1	.02
Eremiacris	--	.96	--	--	12	.21
Hesperotettix (sp.)	.03	.16	--	--	3	.05
Melanoplus bivittatus	5.20	.08	2.44	0.39	201	3.60
Melanoplus femur-rubrum	3.81	1.28	20.12	--	252	4.51
Melanoplus foedus foedus	--	.24	--	--	3	.05
Melanoplus mexicanus	62.02	37.73	18.08	98.84	3,047	54.54
Melanoplus packardii	10.20	4.65	.61	--	428	7.66
Metator nevadensis Brun.	--	.08	--	--	1	.02
Oedaleonotus enigma	.03	15.46	--	--	194	3.47
Phoetaliotes nebrascensis	.39	.16	.20	--	17	.30
Schistocerca shoshone Thos.	.19	.08	--	--	8	.14
Spharagemon collare	.03	--	--	--	1	.02
Trimerotropis latifasciata Scudd.	--	.08	--	--	1	.02

Species	Alfalfa	Range	Wild hay	Small grain	Total specimens	Percentage of grand total
					Number	
Trimerotropis pallidipennis Burn.	0.03	0.32	--	--	5	0.09
Nymphs and undetermined	12.43	5.05	2.24	0.77	523	9.36
Total specimens per environment	3,585	1,247	492	259	5,583	--

NEVADA

The percentages of individuals of the various species present in Nevada, arranged according to crops and habitats infested, are summarized as follows:

Alfalfa	Percent
1. Melanoplus mexicanus	62
2. Melanoplus packardii	10
3. Melanoplus bivittatus	5
4. Conozoa wallula	4
5. Melanoplus femur-rubrum	4
6. 11 other species	3
7. Nymphs and undetermined	12

Wild hay	
1. Camnula pellucida	55
2. Melanoplus femur-rubrum	20
3. Melanoplus mexicanus	18
4. Melanoplus bivittatus	2
5. Conozoa wallula	1
6. 3 other species	2
7. Nymphs and undetermined	2

Range	Percent
1. Melanoplus mexicanus	38
2. Conozoa wallula	28
3. Oedaleonotus enigma	15
4. Melanoplus packardii	5
5. Aulocara elliotti	3
6. 15 other species	6
7. Nymphs and undetermined	5

Small grain	
1. Melanoplus mexicanus	98
2. Melanoplus bivittatus	1
3. Nymphs undetermined	1

Grand total	
1. Melanoplus mexicanus	54
2. Conozoa wallula	9
3. Melanoplus packardii	8
4. Camnula pellucida	5
5. Melanoplus femur-rubrum	4
6. 18 other species	11
7. Nymphs and undetermined	9

NORTH DAKOTA

This is the sixth year in which collections of grasshoppers have been made in the major habitats of the State, and 18,313 specimens were collected in 8 different habitats, about 65 species being represented. Both small-grain and native grasses were classified as to western and eastern, with the division line north and south through Bismarck. Melanoplus mexicanus was the dominant species in 7 out of the 8 environments and formed 37 percent of the total number of specimens collected. In the native grasslands, both eastern and western, Ageneotettix deorum was the dominant species. Compared with 1938, the 1939 collections showed a decrease in the relative abundance of M. mexicanus in all environments excepting small grain. Of the total number collected in the State, M. mexicanus decreased from 49 percent in 1938 to 37 percent in 1939. For the range land, M. mexicanus was the dominant species in 1938 at 32 percent of the total specimens collected, whereas in 1939 it was second in numbers in the eastern section, at 18 percent, and fourth in the western part, at 8 percent. This is a most decided decrease in general occurrence. M. bivittatus showed an increase in relative numbers. None of these data dispute the fact that there are extraordinarily severe infestations of M. mexicanus in eastern North Dakota. By far the greater number of the severe infestations lie in the northeastern part of the State, the severity of which has already been discussed in the first part of this report. The heavy infestation in this part of the State is due to two causes -- first, a local build-up of infestations which were not adequately poisoned during 1939, and second, during July and August there was a gradual but steady influx of migrating adults from the south as far as the northeastern part of South Dakota.

Distribution by species of 18,313 specimens collected in North Dakota, expressed in percentage of total number collected in each habitat

Species	Small grain (east)	Small grain (west)	Native grass (east)	Native grass (west)	Alfalfa sweet-clover	Idle land	Sorghum	Flax	Corn	Millet	Total specimens	Percentage of grand total
											Number	
Acrolophitus hirtipes	--	--	--	0.07	--	0.07	--	--	--	--	2	0.03
Aeoloplus turnbullii	0.04	0.46	--	.42	0.29	.40	--	--	--	0.16	33	.18
Aerochoreutes c. carlinianus Thos.	--	--	--	.03	--	--	--	--	--	--	1	.005
Aeropedellus clavatus	--	--	0.12	.07	.06	--	--	--	--	--	8	.04
Ageneotettix deorum	5.18	3.85	24.32	22.86	12.07	8.83	2.52	1.82	0.60	1.47	2260	12.34
Amblycorypha oblongifolia Deg.	--	--	.29	--	--	--	--	--	--	--	12	.06
Amphitornus coloradus Thos.	--	.19	2.63	12.53	.35	.07	--	--	--	.16	479	2.61
Arphia conspersa conspersa Scudd.	--	--	--	.07	--	--	--	--	--	--	2	.01
Arphia p. pseudonietana	.04	--	.79	.45	--	--	--	--	--	--	47	.26
Arphia sp.	--	--	.02	--	--	--	--	--	--	--	1	.005
Aulocara elliotti	.41	1.04	.82	3.26	.12	.87	.23	.20	1.32	.74	193	1.05
Boopedon nubilum	--	--	--	.07	--	--	--	--	--	--	2	.01
Bruneria brunnea	--	--	.02	1.82	--	--	--	--	--	--	53	.29
Camnula pellucida	2.00	2.94	2.12	6.58	1.58	.20	.69	.71	3.97	2.78	484	2.64
Chloealtis conspersa Harr.	--	--	.02	.03	--	--	--	--	--	--	2	.01
Chortophaga longicornis	.04	--	4.07	1.78	.12	--	--	--	--	--	223	1.22
Chortophaga viridifasciata	--	--	--	.03	--	--	--	--	--	--	1	.005
Circotettix rabula rabula	--	--	--	.03	--	--	--	--	--	--	1	.005
Cordillacris crenulata	--	--	--	.10	--	--	--	--	--	--	3	.02
Derotmema haydenii	--	--	.10	--	--	.13	--	--	--	--	6	.03
Dissosteira carolina	2.70	2.61	.05	--	.47	1.40	8.26	2.22	3.85	2.29	297	1.62
Drepanopterna femoratum	--	--	--	2.59	--	--	--	--	--	--	74	.40
Encoptolophus sordidus Burm.	--	--	.19	--	--	--	--	--	--	--	8	.04
E. sordidus costalis	.68	--	3.49	.87	.53	.80	.92	.91	--	.16	228	1.24
E. sordidus sordidus	--	--	.10	--	--	--	--	--	--	--	4	.02
Eritettix simplex tricarinatus Thos.	--	--	--	.10	--	--	--	--	--	--	3	.02
Hadrotettix trifasciatus	.04	.46	.10	1.43	.06	.87	.23	--	1.08	.08	79	.43
Hesperotettix viridis	--	--	--	.03	--	--	--	--	--	--	1	.005
Hesperotettix viridis pratensis	.07	.39	.63	.80	.33	--	--	--	.24	--	64	.35
Hippiscus rugosus	--	--	--	.07	--	--	--	--	.12	--	2	.01
Hypochlora alba	--	--	1.25	.59	--	--	--	--	--	--	70	.38
Melanoplus angustipennis	1.24	.39	.28	.07	.47	1.34	1.03	1.92	1.08	1.47	135	.74

NORTH DAKOTA (Continued)

Species	Small grain (east)	Small grain (west)	Native grass (east)	Native grass (west)	Alfalfa sweet-clover	Idle land	Sor-ghum	Flax	Corn	Millet	Total speci-mens	Percen-tage of grand total
											Number	
M. bivittatus	7.70	4.96	0.65	0.21	16.17	8.10	17.09	9.59	27.59	14.16	1357	7.41
M. bowditchi canus	--	--	--	.87	--	--	--	--	--	--	25	.14
M. confusus	--	--	--	.07	--	.07	--	--	--	--	3	.02
M. dawsoni	.22	.06	5.66	1.82	1.29	.47	.23	--	.36	.16	330	1.80
M. differentialis	1.43	4.24	--	--	2.58	.20	7.57	.20	3.73	4.91	291	1.59
M. femur-rubrum	8.86	1.96	1.35	.98	19.86	10.78	10.78	15.55	6.75	7.20	1242	6.78
M. f. flavidus	.15	--	.51	.07	.06	--	.34	--	--	--	31	.17
M. gladstoni	.22	--	4.82	.70	.47	.53	--	.40	--	--	246	1.34
M. infantilis	.04	.26	5.45	4.69	.70	.53	--	.10	--	.08	387	2.11
M. keeleri luridus	--	.06	.03	.14	--	--	--	--	--	--	19	.10
M. k. kennicotti Scudd.	--	--	--	.07	--	--	--	--	--	--	2	.01
M. mexicanus	60.10	70.82	17.77	7.56	35.44	44.98	36.70	58.18	38.31	55.73	6810	37.18
M. occidentalis	--	--	--	.28	--	--	--	--	--	--	8	.04
M. packardii	7.06	3.72	.99	1.50	7.15	14.26	11.01	5.66	8.19	7.20	972	5.31
Mermiria maculipennis macclungi-	--	.06	--	.70	--	--	--	--	--	--	21	.11
Metator pardalinus	.19	.39	1.08	3.75	.06	.20	.11	--	--	--	168	.92
Neopodismopsis abominalis Thos.	--	--	.17	.38	--	--	--	--	--	--	18	.10
Opeia obscura	--	--	3.08	1.82	--	--	--	--	.24	--	182	.99
Orphulella p. pelidna	--	--	2.77	.42	--	--	--	--	--	--	127	.69
Orphulella speciosa	--	--	3.35	.07	--	.07	--	--	--	--	142	.77
Pardalophora haldemanii	--	--	.02	.03	--	--	--	--	--	--	2	.005
Phlibostroma quadrimaculatum	.04	--	1.73	11.73	--	.07	--	--	--	--	409	2.23
Phoetaliotes nebrascensis	.37	.19	3.93	1.47	.35	.67	.80	.20	--	.49	249	1.36
Schistocerca lineata	--	--	.05	.03	--	.67	--	--	--	--	13	.07
Spharagemon collare	1.01	.19	.36	.03	.70	1.61	1.26	.30	1.93	.65	120	.65
Spharagemon equale	.07	.72	.12	.56	.06	1.14	.11	.10	.48	--	58	.32
Stethophyma gracilis Scudd.	--	--	.24	.14	--	--	--	--	--	--	14	.08
Trachyrhachis kiowa	--	--	--	.03	--	--	--	--	--	--	1	.005
T. kiowa kiowa	.04	--	.29	2.56	--	.07	.11	.10	--	.08	173	.94
Trimerotropis campestris McN.	--	--	--	.17	--	.07	--	--	--	--	6	.03
T. laticincta	--	--	--	--	--	.07	--	--	--	--	1	.005
T. pallidipennis salina McN.	--	--	.19	.14	--	--	--	--	--	--	12	.06

NORTH DAKOTA (Continued)

Species	Small grain (east)	Small grain (west)	Native grass (east)	Native grass (west)	Alfalfa sweet-clover	Idle land	Sorghum	Flax	Corn	Millet	Total specimens	Percentage of grand total
											Number	
T. pistrinaria	---	---	---	0.14	---	---	---	---	---	---	4	0.02
Undetermined Melanoplus	---	---	---	---	---	0.07	---	---	---	---	1	.005
Undetermined Trimerotropis	---	---	0.05	---	---	---	---	---	---	---	2	.01
Undetermined	0.04	---	.05	---	0.06	.07	---	---	0.12	---	6	.03
Crickets	---	---	.24	---	---	---	---	---	---	---	10	.05
Nymphs	---	---	1.30	---	---	---	---	1.82	---	---	72	.39
Total specimens per environment	2,662	1,532	4,148	2,856	1,707	1,494	872	990	830	1,222	18,313	---

NORTH DAKOTA

The percentages of individuals of the various species present in North Dakota, arranged according to crops infested, are summarized as follows:

Small grain (eastern)	Percent
1. Melanoplus mexicanus	60
2. M. femur-rubrum	9
3. M. bivittatus	8
4. M. packardii	7
5. Ageneotettix deorum	5
6. 21 other spp. and undet.	11

Small grain (western)	Percent
1. Melanoplus mexicanus	71
2. M. bivittatus	5
3. M. differentialis	4
4. Ageneotettix deorum	4
5. M. packardii	4
6. 17 other species	12

Native grassland (eastern)	
1. Ageneotettix deorum	24
2. Melanoplus mexicanus	18
3. M. dawsoni	6
4. M. infantilis	5
5. M. gladstoni	5
6. 39 other spp., undet., crickets, and nymphs	42

Native grassland (western)	
1. Ageneotettix deorum	23
2. Amphitornus coloradus	12
3. Phlibostroma quadrimaculatum	12
4. M. mexicanus	8
5. Camnula pellucida	7
6. 51 other species	38

Alfalfa and sweetclover	
1. Melanoplus mexicanus	35
2. M. femur-rubrum	20
3. M. bivittatus	16
4. Ageneotettix deorum	12
5. M. packardii	7
6. 20 other spp., and undet.	10

Idle land	
1. Melanoplus mexicanus	45
2. M. packardii	14
3. M. femur-rubrum	11
4. Ageneotettix deorum	9
5. M. bivittatus	8
6. 26 other spp. and undet.	13

Sorghum	
1. Melanoplus mexicanus	37
2. M. bivittatus	17
3. M. packardii	11
4. M. femur-rubrum	11
5. Dissosteira carolina	8
6. 13 other species	16

Flax	
1. Melanoplus mexicanus	58
2. M. femur-rubrum	15
3. M. bivittatus	10
4. M. packardii	6
5. Dissosteira carolina	2
6. 12 other spp. and nymphs	9

Corn	
1. Melanoplus mexicanus	38
2. M. bivittatus	28
3. M. packardii	8
4. M. femur-rubrum	7
5. Camnula pellucida	4
6. Dissosteira carolina	4
7. 11 other spp. and undet.	11

Millet	
1. Melanoplus mexicanus	56
2. M. bivittatus	14
3. M. femur-rubrum	7
4. M. packardii	7
5. M. differentialis	5
6. 14 other species	11

Grand total	Percent
1. Melanoplus mexicanus	37
2. Ageneotettix deorum	12
3. M. bivittatus	7
4. M. femur-rubrum	7
5. M. packardii	5
6. 62 other spp., undet., crickets, and nymphs	32

OKLAHOMA

This is the third year in which collections have been made in Oklahoma during the adult survey, and 2,059 specimens were taken in 8 major habitats -- less than half the number collected in 1938. The reason for this is the fact that populations have fallen off to almost zero in many places. There were 45 species in the collections. Melanoplus differentialis was the dominant species in 5 out of the 8 environments and for the State as a whole. Aeoloplus turnbullii bruneri and M. packardii were dominant in small grain, with M. differentialis a close third. M. mexicanus has not been an important grasshopper in Oklahoma and is still far from being as important here as elsewhere.

All but the Panhandle portion of the State has little or no infestation. Texas and Cimarron Counties are by far the only two counties with severe infestations, where large areas of idle land, grain, and sorghum stubble have infestations.

Distribution by species of 2,059 specimens collected in Oklahoma, expressed in percentage of total number collected in each habitat

Species	Woodland	Sorghum	Field margin	Bottom land	Idle land	Range land	Alfalfa	Small grain	Total specimens	Percentage of grand total
									Number	
Aeoloplus turnbullii bruneri	--	--	17.66	2.19	3.66	0.21	6.67	21.48	208	10.10
Ageneotettix deorum	6.85	--	3.98	1.46	1.22	17.27	1.67	2.22	128	6.22
Arphia simplex Scudd.	--	--	--	.73	--	--	--	--	1	.05
Aulocara elliotti	--	1.96	1.59	1.46	.81	1.92	--	2.22	32	1.55
Boopedon nubilum	--	--	--	--	--	--	--	.37	1	.05
Brachystola magna	--	--	.66	--	.41	.64	--	.37	10	.48
Campylocantha o. olivacea	--	--	--	--	.41	--	--	--	1	.05
Chortophaga viridifasciata	2.74	--	.40	3.65	.41	1.28	1.67	--	18	.87
Dissosteira longipennis	20.55	--	.53	6.57	--	5.97	--	3.33	65	3.16
Encoptolophus subgracilis texensis Burm.	--	--	.13	--	--	--	--	--	1	.05
Encoptolophus sordidus costalis	--	--	--	--	--	.43	--	--	2	.10
Hadrotettix trifasciatus	--	--	.53	--	--	3.62	--	1.11	24	1.16
Hesperotettix speciosus	5.48	--	2.12	2.19	17.07	1.49	--	1.48	76	3.69
Hesperotettix viridis viridis	--	--	--	2.92	.81	3.84	--	.37	25	1.21
Hippiscus rugosus	1.37	--	1.19	3.65	.41	2.77	--	--	29	1.41
Melanoplus angustipennis impiger Scudd.	10.96	--	2.12	3.19	15.85	5.97	1.67	.37	96	4.66
M. arizonae Scudd.	--	--	.66	--	--	.85	--	1.85	14	.68
M. bispinosus Scudd.	--	--	.26	--	.81	.64	--	--	7	.34
M. bivittatus	--	--	5.44	16.79	8.94	4.05	20.00	2.22	123	5.97
M. differentialis	--	41.18	17.93	27.01	23.17	1.49	38.33	20.37	335	16.27
M. femur-rubrum	--	--	--	--	--	--	1.67	--	1	.05
M. flavidus	--	5.88	.13	--	2.44	.21	--	.37	12	.58
M. foedus foedus	--	1.96	1.06	.73	6.10	1.49	3.33	.37	35	1.70
M. foedus iselyi Hebard	--	3.92	2.39	2.92	2.44	1.28	1.67	.74	39	1.89
M. glaucipes Scudd.	--	--	.13	.73	.41	--	5.00	--	6	.29
M. lakinus	--	1.96	.93	--	.81	.64	1.67	.37	15	.73
M. mexicanus	--	17.65	13.94	.73	2.03	1.07	5.00	13.33	164	7.96
M. packardii	--	7.84	10.09	8.76	6.10	10.87	10.00	21.11	221	10.73

Species	Woodland	Sorghum	Field margin	Bottomland	Idle land	Range land	Alfalfa	Small grain	Total specimens	Percentage of grand total
									Number	
Melanoplus ponderosus Scudd.	--	--	0.13	1.46	1.63	--	--	--	7	0.34
M. regalis	--	--	--	--	--	0.21	--	--	1	.05
Mermiria maculipennis	1.37	1.96	1.46	1.46	.41	4.90	--	1.48	43	2.09
Mermiria neomexicana	--	--	--	--	.41	.21	--	--	2	.10
Opeia obscura	--	--	.66	1.46	.41	3.20	--	--	23	1.12
Orphulella speciosa	--	--	.40	--	--	.85	--	--	7	.34
Pardalophora saussueri Scudd.	9.59	--	.53	--	--	.43	--	--	13	.63
Phlibostroma quadrimaculatum	--	--	.93	2.92	--	.85	--	--	15	.73
Schistocerca a. americana	--	--	.13	1.46	--	--	--	--	3	.14
S. lineata	2.74	--	--	.73	--	.43	--	--	5	.24
Spharagemon collare	34.25	1.96	2.12	--	1.22	2.13	1.67	--	56	2.72
Spharagemon equale	--	1.96	.53	--	--	1.92	--	1.85	19	.92
Syrbula admirabilis	1.37	--	1.59	2.19	1.22	11.30	--	.37	73	3.54
Trachyrhachis kiowa fuscifrons	1.37	--	.80	--	--	5.33	--	--	32	1.55
T. kiowa kiowa	--	--	.26	--	--	--	--	--	2	.10
Trimerotropis p. pallidipennis	--	5.88	.53	--	--	--	--	.37	8	.39
T. citrina Scudd.	--	1.96	--	3.65	--	--	--	--	6	.29
Undetermined	1.37	1.96	1.06	--	.41	--	--	.37	12	.58
Nymphs	--	1.96	4.91	--	--	.21	--	1.48	43	2.09
Total specimens per environment	73	51	753	137	246	469	60	270	2059	--

OKLAHOMA

The percentages of individuals of the various species present in Oklahoma, arranged according to crops infested, are summarized as follows:

Woodland

		Percent
1.	Spharagemon collare	34
2.	Dissosteira longipennis	21
3.	M. angustipennis impiger	11
4.	Pardalophora sausseri	10
5.	Ageneotettix deorum	7
6.	7 other spp., and undet.	17

Sorghum

		Percent
1.	Melanoplus differentialis	41
2.	M. mexicanus	18
3.	M. packardii	8
4.	M. flavidus	6
5.	Trimerotropis p. pallidipennis	6
6.	8 other spp., undet., and nymphs	21

Field margin

		Percent
1.	Melanoplus differentialis	18
2.	Aeoloplus turnbullii bruneri	18
3.	M. mexicanus	14
4.	M. packardii	10
5.	M. bivittatus	5
6.	30 other spp., undet., and nymphs	35

Bottom land

		Percent
1.	Melanoplus differentialis	27
2.	M. bivittatus	17
3.	M. packardii	9
4.	Dissosteira longipennis	7
5.	Chortophaga viridifasciata	4
6.	Hippiscus rugosus	4
7.	Trimerotropis citrina Scudd.	4
8.	18 other species	28

Idle land

		Percent
1.	Melanoplus differentialis	23
2.	Hesperotettix speciosus	17
3.	M. angustipennis impiger	16
4.	M. bivittatus	9
5.	M. foedus foedus	6
6.	M. packardii	6
7.	20 other spp., and undet.	23

Range land

		Percent
1.	Ageneotettix deorum	17
2.	Syrbula admirabilis	11
3.	M. packardii	11
4.	Dissosteira longipennis	6
5.	M. angustipennis impiger	6
6.	29 other spp., and nymphs	49

Alfalfa

		Percent
1.	Melanoplus differentialis	38
2.	M. bivittatus	20
3.	M. packardii	10
4.	Aeoloplus turnbullii bruneri	7
5.	M. glaucipes Scudd.	5
6.	M. mexicanus	5
7.	8 other species	15

Small grain

		Percent
1.	Aeoloplus turnbullii bruneri	21
2.	Melanoplus packardii	21
3.	M. differentialis	20
4.	M. mexicanus	13
5.	Chortophaga viridifasciata	3
6.	18 other spp., undet., and nymphs	22

Grand total

		Percent
1.	Melanoplus differentialis	16
2.	M. packardii	11
3.	Aeoloplus turnbullii bruneri	10
4.	M. mexicanus	8
5.	Ageneotettix deorum	6
6.	M. bivittatus	6
7.	39 other spp., undet., nymphs	43

OREGON

This is the second year that collections have been made in Oregon during the adult survey, and 741 specimens were collected in 6 typical environments. Some of the collections were too small to furnish reliable information on the relative abundance of species. For the State as a whole, Melanoplus mexicanus was the dominant species, with Camnula pellucida second, and M. femur-rubrum a close third in the numbers collected. Infestations are very localized, consisting of spotted areas in the northeastern five counties. In Harney, Lake, Grant, and Klamath Counties there is a total of 15,000 acres of C. pellucida egg beds.

Distribution by species of 741 specimens collected in Oregon, expressed in percentage of total number collected in each habitat

Species	Range	Ditch bank	Alfalfa (legumes)	Small grain	Wild-hay meadow	Marsh-land	Total specimens	Percentage of grand total
							Number	
Ageneotettix deorum	1.05	--	--	--	--	--	1	0.13
Amphitornus coloradus	3.16	--	--	--	--	--	3	.40
Arphia p. pseudonietana	7.37	--	0.46	--	0.46	--	9	1.21
Aulocara elliotti	1.05	--	--	--	--	--	1	.13
Cannula pellucida	13.68	37.50	--	9.26	51.16	20.19	170	22.94
Circotettix undulatus	2.10	--	--	--	--	--	2	.27
Chortippus longicornis	--	--	1.38	--	6.05	3.85	20	2.70
Conozoa wallula	--	--	.46	5.55	--	1.92	6	.81
Cratypedes neglectus Thos.	2.10	--	--	3.70	--	--	4	.54
Dissosteira carolina	--	--	1.38	27.78	--	--	18	2.43
Dissosteira spurcata Sauss.	3.16	--	--	--	--	--	3	.40
Melanoplus bivittatus	2.10	3.57	18.43	5.55	--	1.92	49	6.61
M. femur-rubrum	2.10	57.14	30.87	3.70	16.74	23.08	163	22.00
M. foedus foedus	--	--	4.61	5.55	--	--	13	1.75
M. mexicanus	51.58	1.78	28.11	38.89	23.25	46.15	230	31.04
Oedaleonatus enigma	1.05	--	--	--	.46	--	2	.27
Phoctaliotes nebrascensis	--	--	5.99	--	--	--	13	1.75
Spharagemon equale	5.26	--	.46	--	--	--	6	.81
Trimerotropis p. pallidipennis	--	--	5.53	--	--	.96	13	1.75
Trimerotropis suffussus	--	--	--	--	.46	--	1	.13
Nymphs	4.21	--	2.30	--	1.39	1.92	14	1.89
Total specimens per environment	95	56	217	54	215	104	741	--

OREGON

The percentages of individuals of the various species present in Oregon, arranged according to crops infested, are summarized as follows:

Range	Percent
1. Melanoplus mexicanus	52
2. Camnula pellucida	14
3. Arphia p. pseudonietana	7
4. Spharagemon equale	5
5. Amphitornus coloradus	3
6. Dissosteira spurcata	3
7. 6 other species and nymphs	16

Ditch bank	Percent
1. Melanoplus femur-rubrum	57
2. Camnula pellucida	37
3. M. bivittatus	4
4. M. mexicanus	2

Alfalfa (legumes)	
1. Melanoplus femur-rubrum	31
2. M. mexicanus	28
3. M. bivittatus	18
4. Phoetaliotes nebrascensis	6
5. Trimerotropis p. pallidipennis	5
6. M. foedus foedus	5
7. 5 other species and nymphs	7

Small grain	
1. Melanoplus mexicanus	39
2. Dissosteira carolina	28
3. Camnula pellucida	9
4. Conozoa wallula	5
5. M. bivittatus	5
6. M. foedus foedus	5
7. 2 other species	9

Wild-hay meadow	
1. Camnula pellucida	51
2. Melanoplus mexicanus	23
3. M. femur-rubrum	17
4. Chortippus longicornis	6
5. 3 other species and nymphs	3

Marshland	
1. Melanoplus mexicanus	46
2. M. femur-rubrum	23
3. Camnula pellucida	20
4. Chortippus longicornis	4
5. Conozoa wallula	2
6. M. bivittatus	2
7. 1 other species and nymphs	3

Grand total	Percent
1. Melanoplus mexicanus	31
2. Camnula pellucida	23
3. M. femur-rubrum	22
4. M. bivittatus	7
5. Chortippus longicornis	3
6. 15 other species and nymphs	14

SOUTH DAKOTA

This is the sixth year in which collections have been made in South Dakota. A total of 12,042 specimens were taken in 10 habitats, with 65 species included in the collections. Melanoplus mexicanus was the dominant species in 5 out of the 10 habitats and in the total number of specimens collected in the State. Ageneotettix deorum was second in numbers, being the most numerous of all specimens taken in 3 out of the 10 environments. Collections were made too late to get representative numbers of M. bivittatus and it may have been equal in numbers to M. differentialis, which was third in relative abundance. M. mexicanus has decreased in relative abundance and Ageneotettix deorum has greatly increased. The heaviest infestations are in the eastern and south-central parts of the State. Flights out of the Black Hills section, in the western part of the State, greatly reduced populations there.

SOUTH DAKOTA

Distribution by species of 12,042 specimens collected in South Dakota, expressed in percentage of total number collected in each habitat

Species	Field margin	Small grain	Legumes	Corn	Sorghum	Idle land	Open range	Native hay	River breaks	Bottom land	Total specimens	Percentage of grand total
											Number	
Aeoloplus turnbullii bruneri	--	--	--	--	--	0.21	--	--	--	0.31	6	0.05
Aeoloplus turnbullii	4.89	2.95	1.40	0.40	0.17	1.45	--	0.17	0.94	1.57	212	1.76
Aeropedellus clavatus	--	--	--	--	--	--	--	--	--	.08	1	.01
Ageneotettix deorum	9.68	6.32	3.63	3.64	.17	3.52	44.30	34.74	18.49	23.41	2171	18.02
Amphitornus coloradus	.21	--	--	--	--	1.55	4.23	3.54	2.19	2.20	193	1.60
Arphia p. pseudonietana	--	--	--	--	--	--	.14	1.21	--	.24	20	.17
Aulocara elliotti	3.19	7.13	.14	5.47	.33	1.76	4.37	12.71	2.19	5.03	578	4.80
Boopedon nubilum	.05	.24	--	1.82	--	--	--	1.12	1.10	.08	36	.30
Brachystola magna	--	--	--	--	.17	--	--	--	.94	.08	8	.07
Cannula pellucida	--	.05	--	--	--	--	--	.35	--	1.26	21	.17
Chortippus longicornis	--	--	--	--	--	--	--	.43	.16	.16	8	.07
Circotettix rabula nigra-fasciatus Beamer	--	--	--	--	--	--	--	--	.78	--	5	.04
Cordillacris crenulata	--	--	--	--	--	--	.28	--	--	--	6	.05
C. occipitalis cinerea	--	--	--	--	--	--	--	--	.31	--	2	.02
C. o. occipitalis	--	--	--	.20	--	--	.28	.35	--	--	11	.09
Dactylotum pictum	--	--	--	--	--	--	.09	--	1.41	--	11	.09
Derotmema haydenii	1.85	.62	--	1.01	.17	.10	.28	--	--	1.02	75	.62
Dissosteira carolina	.82	.90	--	3.04	3.82	.31	--	.26	.16	1.57	100	.83
Drepanopterna femoratum	.15	--	--	.20	--	--	1.07	.43	--	.31	36	.30
Encoptolophus sordidus costalis	--	--	--	--	--	.10	.19	1.64	--	.39	29	.24
Hadrotettix trifasciatus	.41	.28	--	.20	.33	.10	.60	.43	1.57	.71	55	.46
Hesperotettix speciosus	.10	--	.28	--	--	--	.14	--	1.10	.78	24	.20
H. viridus pratensis	1.44	.33	--	--	.17	.21	.05	--	1.41	.55	55	.46
H. viridis viridis	--	--	--	.40	--	--	--	--	--	--	2	.02
Hippiscus rugosus	--	--	--	--	--	--	.42	.35	2.66	.16	32	.26
Hypochlora alba	--	--	--	--	--	--	.09	.35	.47	.86	20	.17

Species	Field margin	Small grain	Legumes	Corn	Sorghum	Idle land	Open range	Native hay	River breaks	Bottom land	Total specimens	Percentage of grand total
											Number	
Melanoplus angustipennis	2.99	2.61	2.09	3.24	1.33	0.21	0.14	0.86	0.94	2.04	199	1.65
M. bivittatus	8.09	2.61	8.52	18.02	15.95	2.07	--	1.38	3.29	9.82	640	5.31
M. bowditchi Scudd.	--	.71	--	--	--	--	--	--	--	--	15	.12
M. bowditchi canus	--	--	--	--	--	--	--	--	6.74	--	43	.36
M. confusus	--	--	--	--	--	--	--	--	.16	--	1	.01
M. dawsoni	--	--	--	--	--	--	.05	.69	1.10	.16	18	.15
M. differentialis	14.01	10.07	11.87	30.57	42.52	5.70	.19	.43	2.98	8.17	1163	9.65
M. fasciatus	--	--	--	--	--	--	--	--	1.10	--	7	.06
M. femur-rubrum	4.17	5.08	19.69	3.04	2.66	1.76	.88	1.99	.16	2.98	458	3.80
M. flavidus	.10	.05	--	--	--	--	--	--	--	--	3	.02
M. f. flavidus	--	--	--	.61	--	--	--	--	--	--	3	.02
M. foedus fluviatilis	--	--	--	--	--	--	--	--	--	1.49	19	.16
M. foedus foedus	--	--	--	--	--	.10	--	--	--	--	1	.01
M. gladstoni	.21	.33	9.08	--	--	.52	2.05	.69	.63	.08	138	1.14
M. infantilis	--	--	--	--	--	.10	.37	.17	.63	.08	16	.13
M. keeleri luridus	--	--	--	--	--	--	--	--	.47	--	3	.02
M. lakinus	1.49	1.05	0.14	.20	.17	.21	--	--	--	.24	59	.49
M. mexicanus	32.55	46.47	35.06	15.59	19.10	66.01	6.04	16.68	24.92	16.18	3378	28.04
M. occidentalis	--	--	--	--	--	--	.14	--	.78	--	8	.07
M. packardii	8.50	6.18	4.75	6.07	8.64	10.67	.42	.60	5.01	2.51	594	4.93
M. scudderi	--	--	--	.40	--	--	--	--	--	--	2	.02
Mermiria maculipennis macclungi-	.21	.47	--	.40	--	--	1.02	3.20	3.45	6.05	174	1.44
Mermiria neomexicana	--	--	--	--	--	--	--	--	.16	--	1	.01
Metator pardalinus	.21	--	--	.20	--	.21	.14	.60	--	.47	23	.19
Opeia obscura	.10	--	--	.20	--	--	4.56	.26	--	.23	107	.89
Orphulella p. pelidna	--	.05	--	--	--	--	.05	.17	--	.08	5	.04
Orphulella speciosa	.05	--	--	--	--	--	.28	3.63	2.82	.78	77	.64
Pardalophora haldemanii	--	--	--	--	--	--	--	--	.16	--	1	.01
Phlibostroma quadrimaculatum	.21	--	--	--	--	--	20.46	1.56	2.82	.71	489	4.06
Phoetaliotes nebrascensis	1.29	.28	.98	--	.33	.42	1.26	6.83	1.25	3.22	199	1.65
Schistocerca lineata	--	--	--	--	--	--	--	--	.16	.08	2	.02
Spharagemon bolli Scudd.	--	--	--	--	--	--	--	--	.47	.31	7	.06

Species	Field margin	Small grain	Legumes	Corn	Sorghum	Idle-land	Open range	Native hay	River breaks	Bottom land	Total specimens	Percentage of grand total
											Number	
Spharagemon collare	0.67	0.76	0.42	3.24	1.33	0.21	---	0.86	0.31	0.24	73	0.61
Spharagemon equale	.88	1.43	.28	1.82	2.49	1.87	0.74	.86	1.10	2.28	153	1.27
Trachyrhachis k. kiowa	--	--	--	--	--	.31	3.91	.26	1.10	.39	102	.85
Trimerotropis cincta	--	--	--	--	--	--	--	--	.78	--	5	.04
T. laticincta	.05	.05	--	--	--	--	--	--	--	.16	4	.03
T. pallidipennis salina	--	--	--	--	--	--	--	--	---	.08	1	.01
Nymphs	1.18	2.99	1.68	--	.17	.31	.79	.17	.31	.63	131	1.09
Undetermined	--	.05	--	--	--	--	--	--	.31	--	3	.02
Total specimens per environment	1937	2106	716	494	602	965	2,151	1,157	638	1,276	12,042	--

SOUTH DAKOTA

The percentages of individuals of the various species present in South Dakota, arranged according to the different habitats, are summarized as follows:

Field margin

	Percent
1. Melanoplus mexicanus	33
2. Melanoplus differentialis	14
3. Ageneotettix deorum	10
4. Melanoplus packardii	8
5. Melanoplus bivittatus	8
6. 24 other species	26
7. Nymphs	1

Small grain

	Percent
1. Melanoplus mexicanus	46
2. Melanoplus differentialis	10
3. Aulocara elliotti	7
4. Ageneotettix deorum	6
5. Melanoplus packardii	6
6. 21 other species	22
7. Nymphs	3

Alfalfa and sweetclover

1. Melanoplus mexicanus	35
2. Melanoplus femur-rubrum	20
3. Melanoplus differentialis	12
4. Melanoplus gladstoni	9
5. Melanoplus bivittatus	8
6. 10 other species	14
7. Nymphs	2

Corn

1. Melanoplus differentialis	31
2. Melanoplus bivittatus	18
3. Melanoplus mexicanus	16
4. Melanoplus packardii	6
5. Aulocara elliotti	5
6. 19 other species	24

Sorghum

1. Melanoplus differentialis	42
2. Melanoplus mexicanus	19
3. Melanoplus bivittatus	16
4. Melanoplus packardii	9
5. Dissosteira carolina	4
6. 13 other species	10

Restoration land

1. Melanoplus mexicanus	66
2. Melanoplus packardii	11
3. Melanoplus differentialis	6
4. Ageneotettix deorum	3
5. Melanoplus bivittatus	2
6. 20 other species	12

Plains grassland

1. Ageneotettix deorum	44
2. Phlibostroma quadrimaculatum	20
3. Melanoplus mexicanus	6
4. Opeia obscura	5
5. Aulocara elliotti	4
6. 28 other species	20
7. Nymphs	1

Native hay land

1. Ageneotettix deorum	35
2. Melanoplus mexicanus	17
3. Aulocara elliotti	13
4. Phoetaliotes nebracensis	7
5. Orphulella speciosa	4
6. 30 other species	24

River breaks

1. Melanoplus mexicanus	25
2. Ageneotettix deorum	18
3. Melanoplus bowditchi canus	7
4. Melanoplus packardii	5
5. Mermiria m. macclungi	3
6. 39 other species	42

Bottom land

1. Ageneotettix deorum	23
2. Melanoplus mexicanus	16
3. Melanoplus bivittatus	10
4. Melanoplus differentialis	8
5. Mermiria m. macclungi	6
6. 17 other species	36
7. Nymphs	1

SOUTH DAKOTA
(Continued)

Grand total	Percent
1. Melanoplus mexicanus----------	28
2. Ageneotettix deorum----------	18
3. Melanoplus differentialis-----	10
4. Melanoplus bivittatus---------	5
5. Melanoplus packardii----------	5
6. 60 other species-------------	33
7. Nymphs----------	1

TEXAS

This is the third year in which collections have been made in Texas during the adult survey. A total of 732 specimens were collected in 3 environments and 24 species were represented. So far as adults were concerned, M. differentialis was the dominant grasshopper in the collections for the whole State. M. mexicanus, however, was the dominant species in 2 out of the 3 environments, although the number of specimens collected in small grain was too small to draw any accurate conclusion as to the relative abundance of the different species. There were many nymphs in the collections and these were most likely M. mexicanus, because the second generation of this species was just in the nymphal stage at the time the collections were made. M. mexicanus has increased in its relative abundance over 1938.

In areas where a second generation of M. mexicanus occurs, the problem of control becomes complicated. Some observations where such phenomena occur have shown that satisfactory baiting has been done for the first generation, but the fecundity of the females left often produced a second infestation equal to or greater than the first.

In the north-central part of the State, infestations of M. mexicanus are extremely localized in river and creek-bottom land. The worst infestations are in the Northwestern Panhandle counties, but even here the situation is not serious.

TEXAS

Distribution by species of 732 specimens collected in Texas, expressed in percentage of total number collected in each habitat

Species	Small grain	Roadside	Sorghums	Total specimens	Percentage of grand total
				Number	
Aeoloplus turnbullii bruneri	--	4.42	--	24	3.28
Aulocara elliotti	--	.55	--	3	.41
Boopedon nubilum	2.94	.92	--	6	.82
Campylacantha olivacea vivax Scudd.	--	1.10	--	6	.82
Dissosteira longipennis	2.94	.55	2.58	8	1.09
Hesperotettix speciosus	--	1.10	--	6	.82
Hesperotettix viridis viridis	--	1.47	--	8	1.09
Melanoplus angustipennis impiger	--	.37	--	2	.27
M. arizonae	--	1.66	--	9	1.23
M. bivittatus	--	1.29	.64	8	1.09
M. differentialis	23.53	13.26	41.93	145	19.81
M. femur-rubrum	--	1.29	--	7	.96
M. foedus foedus	5.88	1.29	1.29	11	1.50
M. lakinus	2.94	9.76	3.22	59	8.06
M. mexicanus	47.06	15.10	8.39	111	15.16
M. occidentalis	--	.18	--	1	.14
M. packardii	11.76	8.65	5.81	60	8.20
M. regalis	--	.18	--	1	.14
Merriria maculipennis Rehn	--	.55	--	3	.41
Opeia obscura	--	.18	--	1	.14
Phlibostroma quadrimaculatum	--	.18	--	1	.14
Schistocerca lineata	--	--	.64	1	.14
Spharagemon collare	--	.18	.64	2	.27
Tropidolophus formosus	--	.37	--	2	.27
Undetermined	--	.37	.64	3	.41
Nymphs	2.94	34.99	34.19	244	33.33
Total specimens per environment	34	543	155	732	--

TEXAS

The percentages of individuals of the various species present in Texas, arranged according to crops infested, are summarized as follows:

Small grain	Percent
1. Melanoplus mexicanus	47
2. M. differentialis	23
3. M. packardii	12
4. M. foedus foedus	6
5. Boopedon nubilum	3
6. Dissosteira longipennis	3
7. M. lakinus	3
8. Nymphs	3

Roadside	Percent
1. Melanoplus mexicanus	15
2. M. differentialis	13
3. M. lakinus	10
4. M. packardii	9
5. Aeoloplus turnbullii bruneri	4
6. 18 other spp., undet., and nymphs	49

Sorghums	
1. Melanoplus differentialis	42
2. M. mexicanus	8
3. M. packardii	6
4. M. lakinus	3
5. Dissosteira longipennis	3
6. 4 other spp., undet., and nymphs	38

Grand total	
1. Melanoplus differentialis	20
2. M. mexicanus	15
3. M. lakinus	8
4. M. packardii	8
5. Aeoloplus turnbullii bruneri	3
6. 19 other spp., undet., and nymphs	46

UTAH

This is the fifth consecutive year in which collections of grasshoppers have been made in typical environments during the adult survey, and 9,176 specimens were collected in 7 environments, 35 species being represented in these collections. Melanoplus mexicanus was the dominant species in the major habitats, with M. femur-rubrum ranking second in importance, M. packardii third, Camnula pellucida fourth, and M. bivittatus fifth. These species occured in about the same order in 1938.

UTAH

Distribution by species of 9,176 specimens collected in various habitats of Utah, expressed in percentages of total numbers collected in each habitat

Species	Alfalfa	Small grain	Grass land	Weeds	Orchard	Truck crops	High mountain	Total specimens	Percentage of grand total
								Number	
Aeoloplus tenuipennis Scudd.	0.01	--	2.35	--	--	--	--	17	0.18
Ageneotettix deorum	.14	0.05	--	--	--	0.80	--	11	.12
Arphia pseudonietana	.26	.32	.58	--	--	--	--	26	.24
Amphitornus coloradus	--	--	.29	--	0.61	--	--	3	.03
Aulocara elliotti	.54	.38	1.32	--	.61	--	--	51	.55
Drepanopterna femoratum	.01	--	.73	--	--	--	--	6	.06
Camnula pellucida	4.51	5.02	10.73	--	--	--	5.26	449	4.89
Chortippus longicornis	.05	--	.44	--	--	--	--	6	.06
Conozoa wallula	.17	--	--	--	--	--	--	11	.12
Dissosteira carolina	.29	2.27	--	3.92	1.23	--	--	64	.70
Dissosteira spurcata	.11	.11	.44	--	--	--	--	12	.13
Hesperotettix sp.	.05	.32	.73	--	--	3.20	--	18	.20
Melanoplus bivittatus	3.33	3.83	.29	--	4.29	2.40	--	291	3.17
Melanoplus borealis monticola	--	--	--	--	--	--	36.82	7	.08
Melanoplus bruneri	--	--	--	--	--	--	57.86	11	.12
Melanoplus confusus	.01	--	--	--	--	--	--	1	.01
Melanoplus complanatipes canonicus Scudd.	--	.16	--	--	--	--	--	3	.03
Melanoplus dawsoni	.08	.05	.15	--	--	--	--	7	.08
Melanoplus differentialis	1.02	1.19	--	--	--	20.80	--	112	1.22
Melanoplus femur-rubrum	34.09	24.68	43.66	5.88	3.68	39.20	--	2943	32.08
Melanoplus keeleri luridus	1.50	.22	--	--	1.23	.80	--	101	1.10
Melanoplus mexicanus	40.38	46.06	16.32	50.96	61.30	25.60	--	3646	39.74
Melanoplus packardii	7.29	10.58	.88	5.88	26.36	1.60	--	706	7.69
Mermiria maculipennis	.03	.11	.15	--	--	--	--	5	.05
Opeia obscura	.03	.05	5.14	--	--	--	--	38	.41
Oedaleonotus enigma	.35	.16	--	--	--	--	--	25	.27
Orphulella pelidna desereta Scudd.	--	.16	3.53	--	--	--	--	27	.29

UTAH (Continued)

Species	Alfalfa	Small grain	Grass land	Weeds	Orchard	Truck crops	High mountain	Total specimens	Percentage of grand total
								Number	
Phoetaliotes nebrascensis----------	0.06	0.16	--	--	--	--	--	7	0.08
Schistocerca shoshone (Thos.)------	.01	--	--	--	--	4.00	--	6	.06
Spharagemon collare----------	.03	.16	--	--	--	--	--	5	.05
Spharagemon equale----------	.06	--	--	--	--	--	--	4	.04
Trachyrhachis kiowa kiowa----------	.08	.49	5.73	31.36	--	--	--	69	.75
Trimerotropis latifasciata Scudd.---	--	.05	2.64	--	--	--	--	19	.21
Trimerotropis p. pallidipennis-----	--	--	.15	--	--	--	--	1	.01
Trimerotropis sparsa Thos.----------	--	--	.29	--	--	--	--	2	.02
Nymphs and undetermined----------	5.84	4.10	3.09	1.96	0.61	1.60	--	466	5.08
Total specimens per environment----------	6275	1865	678	51	163	125	19	9176	--

UTAH

The percentages of individuals of the various species present in Utah, arranged according to crops or habitats infested, are summarized as follows:

Alfalfa

		Percent
1.	Melanoplus mexicanus	40
2.	Melanoplus femur-rubrum	34
3.	Melanoplus packardii	7
4.	Camnula pellucida	5
5.	Melanoplus bivittatus	3
6.	22 other species	5
7.	Nymphs and undet.	6

Small grain

		Percent
1.	Melanoplus mexicanus	46
2.	Melanoplus femur-rubrum	25
3.	Melanoplus packardii	11
4.	Camnula pellucida	5
5.	Melanoplus bivittatus	4
6.	18 other species	5
7.	Nymphs and undet.	4

Grassland

1.	Melanoplus femur-rubrum	44
2.	Melanoplus mexicanus	16
3.	Camnula pellucida	11
4.	Trachyrhachis k. kiowa	6
5.	Opeia obscura	5
6.	16 other species	15
7.	Nymphs and undet.	3

Weeds

1.	Melanoplus mexicanus	51
2.	Trachyrhachis k. kiowa	31
3.	Melanoplus femur-rubrum	6
4.	Melanoplus packardii	6
5.	Dissosteira carolina	4
6.	Nymphs and undet.	2

Orchard

1.	Melanoplus mexicanus	61
2.	Melanoplus packardii	26
3.	Melanoplus bivittatus	4
4.	Melanoplus femur-rubrum	4
5.	Dissosteira carolina	1
6.	3 other species	3
7.	Nymphs and undet.	1

Truck crops

1.	Melanoplus femur-rubrum	39
2.	Melanoplus mexicanus	26
3.	Melanoplus differentialis	21
4.	Schistocerca shoshone	4
5.	Hesperotettix (sp.)	3
6.	4 other species	5
7.	Nymphs and undet.	2

High mountain

1.	Melanoplus bruneri	58
2.	Melanoplus borealis monticola	37
3.	Camnula pellucida	5

Grand total

1.	Melanoplus mexicanus	40
2.	Melanoplus femur-rubrum	32
3.	Melanoplus packardii	8
4.	Camnula pellucida	5
5.	Melanoplus bivittatus	3
6.	30 other species	7
7.	Nymphs and undet.	5

WASHINGTON

This is the first year in which collections of grasshoppers in typical environments have been included in this project. Grasshoppers are not the problem in Washington that they are in other States. This may be due partly to climatic conditions and partly to the farming practices, which leave very little space for egg deposition of the common economic species. A total of 613 specimens were collected in the two major grasshopper habitats--alfalfa and native grasses. Melanoplus femur-rubrum was dominant in the alfalfa and Camnula pellucida in the native grass. Only 9 species are represented in the collections.

The grasshopper populations are at a very low ebb in the State, with infestations limited to alfalfa fields and undisturbed land within the intensively farmed areas. Clean summer fallow, with the land cultivated up to the road's edge, leaving little or no field margin, does not permit the development of infestations within grain stubble of M. mexicanus or other economic species.

WASHINGTON

Distribution by species of 613 specimens collected in Washington, expressed in percentage of total number collected in each habitat

Species	Alfalfa	Native grass	Total specimens	Percentage of grand total
			Number	
Amphitornus coloradus	--	1.27	4	0.78
Arphia p. pseudonietana	--	1.59	5	.81
Cannula pellucida	3.35	39.36	134	21.86
Chortippus longicornis	--	2.22	7	1.14
Cratypedes neglectus	--	.63	2	.33
Dissosteira carolina	.33	.32	2	.33
Melanoplus bivittatus	.67	1.27	6	.98
M. femur-rubrum	49.66	20.63	213	34.75
M. mexicanus	43.62	24.44	207	33.77
Nymphs	2.35	8.25	33	5.38
Total specimens per environment	298	315	613	--

WASHINGTON

The percentages of individuals of the various species present in Washington, arranged according to crops infested, are summarized as follows:

Alfalfa	Percent
1. Melanoplus femur-rubrum	50
2. M. mexicanus	44
3. Camnula pellucida	3
4. M. bivittatus	1
5. 1 other species and nymphs	2

Native grass	Percent
1. Camnula pellucida	39
2. M. mexicanus	24
3. M. femur-rubrum	21
4. Chortippus longicornis	2
5. Arphia p. pseudonietana	2
6. 4 other species and nymphs	12

Grand total	Percent
1. M. femur-rubrum	35
2. M. mexicanus	34
3. Camnula pellucida	22
4. Chortippus longicornis	1
5. M. bivittatus	1
6. 4 other species and nymphs	7

WISCONSIN

This is the fifth year in which collections have been made in typical environments in Wisconsin during the adult survey. There were 6,717 specimens taken in 8 representative habitats, and 19 species are included in the collections. Melanoplus femur-rubrum was by far the dominant species in all 8 habitats, ranging from 63 to 80 percent of the specimens collected in these places and forming 71 percent of the total specimens collected for the State. Melanoplus mexicanus was second in numbers in 7 out of the 8 environments, ranging from 3 to 14 percent of the numbers taken in these habitats and forming 7 percent of the total collected in the State. This does not include the large number of nymphs found in the collections, which are probably M. femur-rubrum because that species hatches late in the season. Altogether, this places M. mexicanus lower in relative abundance and M. femur-rubrum higher, as compared with the 1938 collections.

In 1939 cold rains took care of most of the infestations of M. mexicanus, which hatched early in the summer. In a few counties damage was done to hay and other crops by M. femur-rubrum. Infestations were found in alfalfa, pastures, hay meadows, and some small-grain stubble.

WISCONSIN

Distribution by species of 6,717 specimens collected in Wisconsin, expressed in percentage of total number collected in each habitat

Species	Small grain	Alfalfa	Clover	Corn	Idle land	Road-side	Hay land	Pasture	Total speci-mens	Percent-age of grand total
									Number	
Ageneotettix d. deorum	2.01	---	--	2.26	3.36	1.33	0.59	3.86	112	1.67
Arphia pseudonietana	.11	---	--	--	1.38	.53	--	.36	17	.25
Arphia sulphurea	--	--	--	--	--	.13	--	--	1	.01
Camnula pellucida	.22	0.09	0.35	.32	--	.13	.33	.29	15	.22
Chortippus longicornis	1.45	2.07	2.97	1.61	2.17	1.86	3.35	.87	135	2.01
Dissosteira carolina	--	--	--	--	--	--	--	.14	2	.03
Encoptolophus sordidus sordidus	.33	.09	--	.32	--	.13	.08	.14	9	.13
Melanoplus angustipennis	.67	--	--	--	.20	.40	--	.14	12	.18
Melanoplus bivittatus	--	.63	.70	--	--	.13	.17	.07	15	.22
Melanoplus dawsoni	--	.09	--	--	--	.26	--	--	3	.04
Melanoplus femur-rubrum	69.94	66.94	63.52	80.00	70.16	69.72	73.95	74.80	4773	71.07
Melanoplus flavidus flavidus	--	--	--	--	.59	--	--	--	3	.04
Melanoplus keeleri luridus	.33	.09	--	.32	.20	.13	--	.73	17	.25
Melanoplus mexicanus	5.70	8.44	9.08	2.90	13.64	8.63	2.34	8.30	482	7.18
Orphulella pelidna	.22	--	--	--	--	--	--	.07	3	.04
Orphulella speciosa	.11	--	.17	--	.79	.26	--	.58	16	.24
Pseudopomala brachyptera	--	--	.17	--	--	--	--	--	1	.01
Schistocerca alutacea	--	--	--	--	.39	.13	--	.14	5	.07
Spharagemon collare	.22	--	--	.32	.79	.53	--	.14	13	.19
Nymphs	18.66	21.56	23.04	11.93	6.32	15.67	19.18	9.32	1083	16.12
Total specimens per environment	895	1,113	573	310	506	753	1,194	1,373	6,717	--

WISCONSIN

The percentages of individuals of the various species present in Wisconsin, arranged according to habitats, are summarized as follows:

Small grain	Percent
1. Melanoplus femur-rubrum	70
2. Melanoplus mexicanus	6
3. Ageneotettix deorum	2
4. Chortippus longicornis	1
5. Melanoplus angustipennis	1
6. 7 other species	1
7. Nymphs	19

Alfalfa	Percent
1. Melanoplus femur-rubrum	67
2. Melanoplus mexicanus	8
3. Chortippus longicornis	2
4. Melanoplus bivittatus	1
5. 4 other species	1
6. Nymphs	21

Clover	Percent
1. Melanoplus femur-rubrum	63
2. Melanoplus mexicanus	9
3. Chortippus longicornis	3
4. Melanoplus bivittatus	1
5. 4 other species	1
6. Nymphs	23

Corn	Percent
1. Melanoplus femur-rubrum	80
2. Melanoplus mexicanus	3
3. Ageneotettix deorum	2
4. Chortippus longicornis	2
5. 4 other species	1
6. Nymphs	12

Idle land	Percent
1. Melanoplus femur-rubrum	70
2. Melanoplus mexicanus	14
3. Ageneotettix deorum	3
4. Chortippus longicornis	2
5. Arphia pseudonietana	1
6. 6 other species	4
7. Nymphs	6

Roadside	Percent
1. Melanoplus femur-rubrum	70
2. Melanoplus mexicanus	9
3. Chortippus longicornis	2
4. Ageneotettix deorum	1
5. 9 other species	2
6. Nymphs	16

Hay land	Percent
1. Melanoplus femur-rubrum	74
2. Chortippus longicornis	3
3. Melanoplus mexicanus	2
4. Ageneotettix deorum	1
5. 3 other species	1
6. Nymphs	19

Pasture	Percent
1. Melanoplus femur-rubrum	75
2. Melanoplus mexicanus	8
3. Ageneotettix deorum	4
4. Chortippus longicornis	1
5. Melanoplus keeleri luridus	1
6. 10 other species	2
7. Nymphs	9

Grand total	Percent
1. Melanoplus femur-rubrum	71
2. Melanoplus mexicanus	7
3. Chortippus longicornis	2
4. Ageneotettix deorum	2
5. 15 other species	2
6. Nymphs	16

WYOMING

This is the sixth year in which collections have been made in Wyoming. There were 2,800 specimens collected in 5 habitats and 67 species are included in the collections. Populations were low in the State and it was difficult to find grasshoppers thick enough to get representative collections. Melanoplus mexicanus was the dominant grasshopper in the range land and some miscellaneous crops, including small grain and idle land. M. femur-rubrum was dominant in sweetclover and alfalfa. Both M. mexicanus and M. infantilis were dominant in the mountain meadows. For the infestations as a whole, M. mexicanus has decreased in relative abundance, as well as decreasing enormously in actual abundance.

Distribution by species of 2,800 specimens collected in Wyoming, expressed in percentage of total number collected in each habitat

Species	Range	Mountain meadow	Sweet-clover alfalfa	Miscellaneous crops	Idle land	Total specimens	Percentage of grand total
						Number	
Acrolophitus hirtipes	0.12	--	--	--	--	2	0.07
Aeoloplus turnbullii	.30	--	0.19	--	3.15	14	.50
Aeropedellus clavatus	.36	--	--	--	--	6	.21
Ageneotettix deorum	13.14	1.82	.78	1.48	1.18	232	8.28
Amphitornus coloradus	3.78	.61	--	.49	--	65	2.32
Arphia p. pseudonietana	.66	--	--	--	2.36	17	.61
Aulocara elliotti	10.92	1.82	.98	.49	--	191	6.82
Boopedon nubilum	.06	--	--	--	--	1	.03
Brachystola magna	.06	--	--	--	--	1	.03
Bruneria brunnea	.06	4.24	--	--	--	8	.29
Camnula pellucida	.84	15.76	1.17	--	--	46	1.64
Chortippus longicornis	.90	1.82	--	--	--	18	.64
Circotettix rabula R. & H.	.06	--	--	--	--	1	.03
Cordillacris crenulata	.72	--	--	--	--	12	.43
Cordillacris occipitalis	1.26	--	--	--	--	21	.75
Cratypedes neglectus	--	.61	--	--	--	1	.03
Derotmema haydenii	.12	--	--	--	1.57	6	.21
Dissosteira carolina	.06	--	1.17	2.46	--	12	.43
Dissosteira longipennis	.24	--	--	--	--	4	.14
Drepanopterna femoratum	5.34	--	.19	--	--	90	3.21
Encoptolophus sordidus costalis	1.14	--	--	--	--	19	.68
Hadrotettix trifasciatus	1.20	--	.39	--	2.36	28	1.00
Hesperotettix viridis nevadensis Morse	.96	--	--	--	--	16	.57
Hesperotettix viridis pratensis	.54	--	--	2.46	.39	15	.54
Hesperotettix viridis viridis	.18	--	--	--	--	3	.11
Hypochlora alba	.06	--	--	--	--	1	.03
Melanoplus alpinus	--	1.21	--	--	--	2	.07
Melanoplus angustipennis	1.38	--	--	--	4.33	34	1.21
Melanoplus bivittatus	.12	3.64	8.01	10.84	5.51	85	3.04

Species	Range	Mountain meadow	Sweet clover alfalfa	Miscellaneous crops	Idle land	Total specimens	Percentage of grand total
						Number	
Melanoplus borealis monticola	--	15.15	--	--	--	25	0.89
Melanoplus bowditchi bowditchi	0.48	--	--	--	--	8	.29
Melanoplus bowditchi canus	.48	--	0.19	--	0.39	10	.36
Melanoplus bruneri	--	.61	--	--	--	1	.03
Melanoplus dawsoni	.18	4.24	--	--	--	10	.36
Melanoplus cinerius Scudd.	--	--	--	--	10.63	27	.96
Melanoplus differentialis	--	--	.19	1.48	--	4	.14
Melanoplus femur-rubrum	1.50	1.21	45.12	22.17	--	303	10.82
Melanoplus foedus foedus	1.02	--	.19	2.46	15.35	62	2.21
Melanoplus gladstoni	.84	--	--	--	1.18	17	.61
Melanoplus infantilis	4.56	18,79	.19	--	--	108	3.86
Melanoplus mexicanus	20.29	18.79	28.71	52.71	37.01	717	25.60
Melanoplus occidentalis	1.56	--	--	--	.79	28	1.00
Melanoplus packardii	.90	1.21	1.37	.49	9.05	48	1.71
Mermiria maculipennis	.12	--	2.15	--	--	13	.46
Mestobregma plattei plattei	.12	--	--	--	--	2	.07
Metator pardalinus	2.04	--	--	--	--	34	1.21
Opeia obscura	5.04	--	--	--	--	84	3.00
Orphulella pelidna	.06	--	--	--	--	1	.03
Parapomala wyomingensis	.48	--	--	--	--	8	.29
Pardalophora haldemanii	.06	--	--	--	--	1	.03
Phlibostroma quadrimaculatum	6.78	--	--	--	--	113	4.03
Phoetaliotes nebrascensis	1.44	--	1.76	--	--	33	1.18
Spharagemon collare	.60	--	.19	.98	.39	14	.50
Spharagemon equale	.78	--	--	--	1.97	18	.64
Trachyrhachis kiowa fuscifrons	.06	--	--	--	--	1	.03
Trachyrhachis kiowa kiowa	2.46	--	--	--	--	41	1.46
Trimerotropis agrestis McN.	--	--	--	--	.39	1	.03
Trimerotropis campestris	.18	1.21	--	--	--	5	.18
Trimerotropis laticincta	.12	--	--	--	--	2	.07
Trimerotropis pistrinaria	.06	--	--	--	--	1	.03
Undetermined	--	--	--	--	.39	1	.03
Nymphs	3.18	7.27	7.03	1.48	1.57	108	3.86
Total specimens per environment	1,666	165	512	203	254	2,800	--

WYOMING

The percentages of individuals of the various species present in Wyoming, arranged according to common habitats, are summarized as follows:

Range	Percent
1. Melanoplus mexicanus----	20
2. Ageneotettix deorum-----	13
3. Aulocara elliotti-------	11
4. Phlib. quadrimaculatum--	7
5. Drepanopterna femoratum-	5
6. 48 other species--------	41
7. Nymphs-----------------	3

Mountain meadow	Percent
1. Melanoplus infantilis----	19
2. Melanoplus mexicanus-----	19
3. Camnula pellucida--------	16
4. M. borealis monticola----	15
5. Bruneria brunnea---------	4
6. Melanoplus dawsoni-------	4
7. 18 other species---------	16
8. Nymphs-----------------	7

Sweetclover and alfalfa	
1. Melanoplus femur-rubrum-	45
2. Melanoplus mexicanus----	29
3. Melanoplus bivittatus---	8
4. Mermiria maculipennis---	2
5. Phoetaliotes nebrascensis	2
6. 19 other species--------	7
7. Nymphs-----------------	7

Miscellaneous crops	
1. Melanoplus mexicanus-----	53
2. Melanoplus femur-rubrum--	22
3. Melanoplus bivittatus----	11
4. Dissosteira carolina-----	2
5. Hesp. viridis pratensis--	2
6. Melanoplus foedus foedus-	2
7. 13 other species---------	7
8. Nymphs-----------------	1

Idle land	
1. Melanoplus mexicanus----	37
2. Melanoplus foedus foedus	15
3. Melanoplus cinerius-----	11
4. Melanoplus packardii----	9
5. Melanoplus bivittatus---	6
6. 20 other species--------	20
7. Nymphs-----------------	2

Grand total	
1. Melanoplus mexicanus-----	26
2. Melanoplus femur-rubrum--	11
3. Ageneotettix deorum------	8
4. Aulocara elliotti--------	7
5. Phlib. quadrimaculatum---	4
6. 62 other species---------	40
7. Nymphs-----------------	4